AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.

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VOLUME 20. NEW YORK, THURSDAY, MAY 20, 1897. NUMBER 20.

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## American and Other Machinery Abroad.—II.

[Editorial Correspondence.]

EARLY INFLUENCES.

Years ago Hiram Maxim equipped a shop here with American tools and insisted upon their being used by the English workmen and in the proper way. After a time, owing to some labor difficulty, these men were scattered throughout the kingdom, and it was found that they were continually lamenting the fact that they no longer had the "Yankee tools" to work with. They had learned to like them and were free to say that they could do more work with them and do it easier. Thus, much missionary work was done, and most of those whose business gives them opportunity for observation say that our tools do win favor when once introduced. One man, a dealer in American tools, told me a typical English machine-shop proprietor used to come into his place, look over the tools in the show room, shake his head, say he didn't think they would do for his work and go out. But finally, one day, he said he had a mind to try one of those Yankee lathes. He did so, and then tried others, and has since bought a great many of them and other tools as well, evidently for no other reason than because they gave satisfaction in use.

ADVERSE OPINIONS—FLUCTUATION OF PRICES.

The manager of the machine-tool department of one London dealer told me he did not think there would be a permanent market for American tools here. Referring to the fact that English builders are literally choked with orders and cannot at present take additional ones for delivery under six or eight months usually, he said he thought that when the condition had passed away and British builders became anxious for orders American tools would be driven out by the combined competition of English tools pure and simple and those that would then be made here on American lines. His firm, however, figure as manufacturers of the cheaper class of English machine tools and carry a stock of them in their store as well as of American tools. They do not own the shop (in the Yorkshire district, where cheap English tools mostly come from), but market its product, and it is just possible that the wish may be father to the thought; or, at least that there is on this account little enthusiasm, or interest in, or appreciation of, American tools.

Another man who is well acquainted with the business and very friendly to Americans and their best machine tools seemed also to doubt the continuance of a general American machinery trade, partly because he thought the American practice of jumping prices up and down would be fatal to business here, where they are not used to such things and think that when they buy a machine to-day for a certain price they ought not to be asked to pay a penny more for it next year A concern on the continent of which he is a director makes a lathe. They first put them at a good price and found after a time that they could be made much cheaper. He proposed a reduction of price. His fellow-directors were astonished that such a thing should be thought of, and said: "But what about all these people who have bought these lathes at the present figures? They will consider they have been cheated and will want us to pay them the difference on all the lathes we have sold during the past ten years. We can't change our prices." In fact, it is said that prices of the best English tool builders are much more stable than with us—that, in fact, no matter how hard times may be, the best makers do not change their prices materially, if at all.

This same engineer told me of a continental machine tool dealer who has worked up a good trade in American tools, mostly within the period of our recent trade depression, and who now finds that, after he has secured orders based upon former prices, he is informed that he must expect prices to advance, must pay cash and do various other things not previously required of him, nor in accordance with European methods of doing business. This dealer declared his intention of at once going over to America, explaining how business must be done here if at all, and getting, if possible, definite agreements and fixed quotations. If not possible to do this, then he proposed to wash his hands of the whole business; saying that varying prices and terms would not be submitted to at all by his customers, and to attempt to do business in that way would involve him in endless trouble and difficulty.

Whether these Europeans can be induced to tolerate our commercial methods as they are being induced to tolerate and even admire our mechanical practice is a problem which, perhaps, time alone can solve, but I should think there would always be a goodly proportion of machinery buyers here who can be induced to pay the price fixed by commercial conditions prevailing at the time of purchase.

One prominent American machine tool-builder who has just arrived here, but whose former visits to this side have rendered him more or less familiar with the business here, told me he did not think it would be so extensive as it had been during the past two years, and that American tool-builders must in the nature of things depend mainly upon home trade for the next ten years. He said that it was not his intention to in any way neglect the home trade, and that if it came to waiting for tools it would be the foreigners who would have to wait oftenest and longest, so far as the product of his shop was concerned. If this sentiment is general it will undoubtedly hurt American trade here, and, perhaps, permanently cripple it, should business develop into a rush at home.

A CASE POINTING TOWARD LARGE AND PERMANENT BUSINESS.

There are always rocks which can be steered on to, however, and it is the business of those who sail to steer clear of them; it is my present business to point out such of them as are visible, and that they can be successfully avoided is, perhaps, as strongly indicated as in any other way by the recent doings of Messrs. Chas. Churchill & Co., the pioneers in the business of introducing American tools in this market. We have before referred to the phenomenal growth of their business during the past few years, and I learn that it is still going forward by leaps and bounds—exclusively in American machines and small tools. During a recent period of six months their sales amounted, in their London and Birmingham branches, to $625,000, and it has been found advisable to increase their capital stock to $250,000 in order to

handle the business. In doing this a reorganization was necessary, and among the new board of directors is found the name of Mr. Herbert Chamberlain, who is very prominently connected politically and also with the Birmingham Small Arms factory and other English manufacturing establishments; the significance of this being in the fact that a man thus directly interested in manufacturing here should, after a presumably thorough examination of the business in all its bearings, put considerable capital into it.

Answering an inquiry on that point, Mr. Churchill informs me that their business would still have shown a satisfactory improvement even had there been no demand from the bicycle factories, because other manufacturers are all the while more generally coming to appreciate American tools. At the same time, the trade with bicycle factories has not only been gratifying in itself, but it has brought trade in other lines by reason of the fact that there is always more or less interchange of experience and moving about of workmen, which enables others in other lines of work to know what is being done in the cycle factories by American tools, and to conclude that similar economies may be brought about in their own work. An instance of this spread of reputation and of orders resulting from it is found in the case of the justly famous Tangye establishment into which quite a lot of American tools has recently gone, and one Birmingham builder of machine tools recently placed quite a considerable order for American tools for use in his own shop.

I was surprised to note the fine stock of goods carried at Churchill's, especially in such as drills, milling-cutters, etc., and there may be somewhere in the United States, in the hands of other than manufacturers of them, a stock of American micrometer calipers as large as I saw here, but if so I have never seen it. Their sales of these amount to 15 to 20 per day. They go mainly into the hands of English workmen in the bicycle and other factories, and are found to exert here the same educating and refining influence which is a well recognized result of their general use in our own shops. There are no others than American micrometers, and upon inquiring why they were not made here I was informed that it was simply because it was clearly recognized that so much good and highly refined work could not well be supplied at a competing price.

With the use of such tools and on account of the development of the bicycle factories, wages have shown a tendency to advance, and now frequently reach 50 shillings, or about $12.50 per week for tool-makers, while for other leading hands wages are still higher. To-day I have seen some published figures of wages paid in the ship-building and allied trades in the north of England, which wages would by no means be despised by American mechanics employed in the same lines. This improvement in wages is a powerful factor in the demand for good small tools of all kinds.

Over thirty people are employed in the London house of Churchill & Co. in handling the business, and there are eight or nine in the Birmingham house. The cable is freely used in ordering goods, and, besides tools, there are such items as 24 tons of American steel in a single order; this steel (of a special make) to be used in the construction of bicycles.

Chas. Neat, who is also a pioneer in the work of introducing American tools here, and has a store at 112 Queen Victoria street, is enthusiastic in his belief in the future of the business.

In recognition of a feature of the business previously referred to, Mr. Harry Wharton, who had charge of the exhibit of the London & Northwestern Railway's exhibit at Chicago, and afterward worked in the Pond Machine Tool Company's shops and others in America, has been recently employed by Churchill; and the Niles Tool Works, in establishing their new London branch, have placed it in charge of Mr. W. S. Accles, whose considerable experience in American shops and subsequent management of an English one, give to him the practical knowledge of tools which will undoubtedly be of very great advantage.

### A LONDON SHOP.

As would be expected, the London shop of R. Hoe & Co. is one of those which has been putting in American tools. This is, however, essentially an English shop in its personnel and methods of working and was originally equipped almost entirely with Whitworth tools—among them a so-called "jim crow planer" which reverses the tool at the end of each movement of the bed and planes both ways. It is about 30 years old, however, and the later planers of the same make cut one way only. A portion of this shop is located in what was built years ago for a pin factory, and the original engine room is about as first fitted up—a double beam engine of about 200 horse-power, driving by spur gears an underground shaft which turns about 35 revolutions per minute, and drives, by bevel gears, at the same speed, a vertical shaft 8 inches diameter, which at each floor has bevel gears to drive the various line shafts at a speed of 100 revolutions. The engine house comprises the frame of this engine; the winding stairways are of stone, built into it, and the ceiling is of the "most modern" construction—I-beams with brick arches between them. It is about seventy-five years old. The engine is still used in case anything happens to disable the more modern Galloway which is regularly depended upon. This is a shop where American (Bridgeport Machine Tool Company's) lathes are used along with Whitworth's. They like the American lathes and have given repeated orders for them. Not only the proprietors, but the men also like them.

### A BROKEN STEAM PIPE.

I do not know to what extent it has become known in America, but here I have seen nothing published regarding a break which occurred in the main steam pipe of the "New York" when about two days out from New York, from whence she sailed on March 31st. There was quite evidently no disposition on the part of the officers to be communicative regarding the accident, but the facts seem to be that a crack developed in the 14-inch copper main pipe within one of the stoke-holes, and in such a place that it proved impossible to either effect temporary repairs or shut a valve which would have relieved that section of pressure, though a slow-down of about an hour and a half's duration took place for that purpose. The leaking steam rendered the stoke-hole untenable, and thus compelled the abandonment of at least three furnaces—perhaps more. The steam was drawn by a fan up through a large ventilator and escaped in a cloud to the atmosphere, so that the amidship section of the upper deck was enshrouded by it during all the remainder of the voyage, the steam thus wasted and the fact that one stoke-hole had been abandoned making it impossible to keep up a full head of steam and resulting in a slow voyage. Steam also leaked from the fire room up through various interstices into the supplementary first cabin dining room, spoiling some fine cabinet work, upholstery and white and gold decorations. A good many things seem to be happening to vessels of that line of late, and there are those who attribute this to the fact that the four leading ships have only about three, or at the most a little less than four, days in port at each end of their runs, and are thus kept almost constantly going, so that there is not sufficient time for the careful inspection and maintenance that should be given them.

F. J. M.

London, April 17th.

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The circulation of wonder stories as to the things to be done with liquid air is now in order. The operation of liquefying air has become a tolerably familiar one. The cost of the liquefaction upon a commercial scale is far from being settled. As to the storage and transmission of the liquid when its temperature must be kept at more than two hundred degrees below zero, it will not easily be believed to be practicable or profitable.

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Something is being done in France in applying the gas engine to boat propulsion. A boat 100 feet long and 7 feet draft has been put on the Havre-Rouen-Paris line. The gas is carried at about 850 pounds pressure, and a two-cylinder engine of 40 horse-power drives the boat at about 7 miles an hour.

## Factors of Safety.

The following, from Circular No. 15 of the Division of Forestry of the United States Department of Agriculture, is strikingly in line with our recent editorial upon the same topic:

"It will be admitted by all engineers that the factors of safety as used at present can hardly be claimed to be more than guesswork. There is not an engineer who could give account as to the basis upon which numerically the factors of safety for wood have been established as "8 for steady stress; 10 for varying stress; 15 for shocks" (see Merriman's Testbook on the Mechanics of Materials); or as 4 to 5 for "dead" load and 5 to 10 for "live" load (see Rankine's Handbook of Civil Engineering). The directions for using these indeterminate factors of safety given in the text-books would imply that the student or engineer is, after all, to rely on his judgment as to the modification of the factor, i. e., he is to add to this general guess his own particular guess. The factor of safety is in the main an expression of ignorance or lack of confidence in the reliability of values of strength, upon which the designing proceeds, together with an absence of data upon which to inspect the material. With a large number of well-conducted tests, coupled with a knowledge of the quantitative as well as qualitative influences of various factors upon strength, and with definite data of inspection which allow ready sorting of material, the factor of safety, as far as it denotes the residuum of ignorance which may be assumed to remain, as to the character and behavior of the material, may be reduced to a minimum, restricting itself mainly to the consideration of the indeterminable variation in the actual and legitimate application of load."

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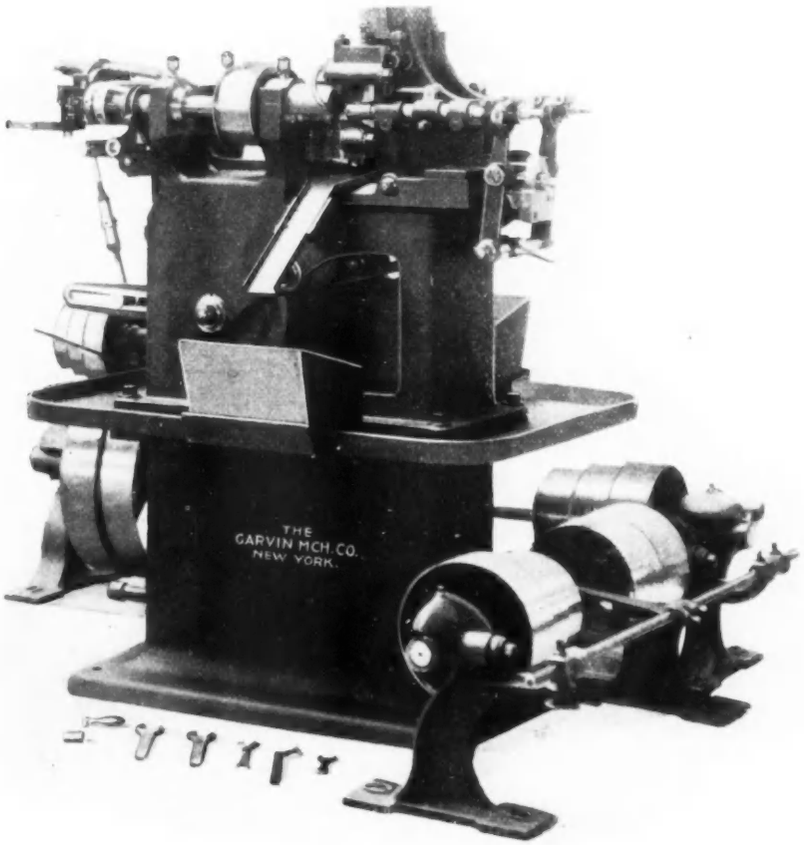
## Automatic Stud Machine.

We illustrate a double spindle automatic stud machine built by the Garvin Machine Company, of New York. The machine is designed for making studs for bicycle chain, small rollers and similar articles usually made from round steel rods. The straight steel rods, a number of them at a time, and in the usual lengths of six feet or so, are laid on horizontal racks extending from the left hand side of the machine. These racks are not shown in the halftone, but one appears in section in Fig. 1. The lowest rod in the vertical slot is in line with the centre of one of the operating spindles, which are, of course, hollow, and the rods are fed in and clamped by the chuck, then released, fed in the length for another stud and clasped again and so on. The turning is done directly above the delivery shute seen in the center of the machine. The levers at the right operate




AUTOMATIC STUD MACHINE.

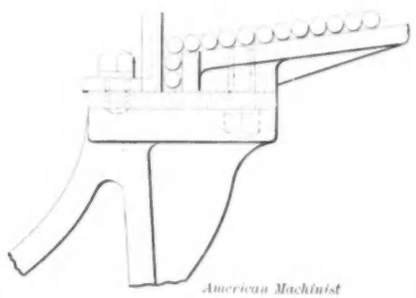



Fig. 1

FEEDING THE STOCK.

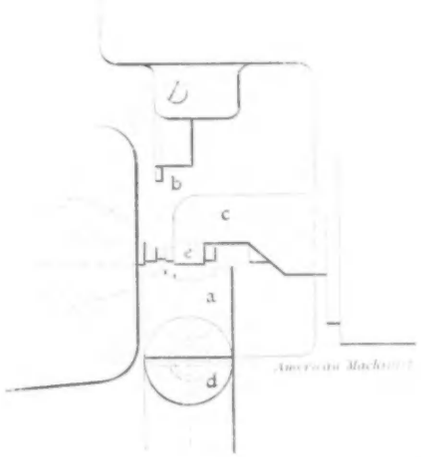



Fig. 2

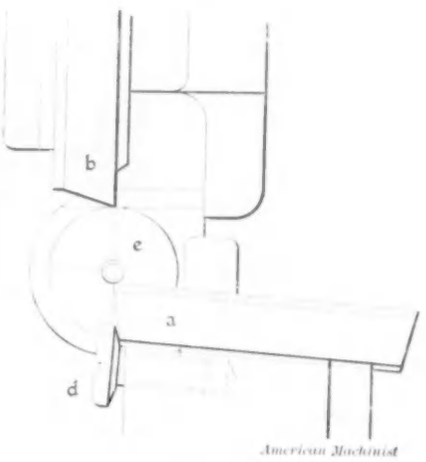



Fig. 3

THE CUTTING TOOLS.

drills when they are required. Figs. 2 and 3 show the tools used in making chain studs, one of which appears at *e*. The shaping tool *a*, of the required profile, is sharpened by grinding on the end and when replaced in the machine requires no setting except to be pushed against the head of the screw *d*. When this tool is cutting the guide *c* advances and steadies the stud, the cutting-off tool *b* being then high up and out of the way. When the shaping tool and the guide *c* are withdrawn, the tool *b* descends with a quick movement to the cutting position, and then the necessary slow cutting-off feed occurs. The tool *a*, when down and out of use, is covered by a little apron, so that

the dropping stud or any chips cannot lodge upon it. Provision is made for taking care of the last end of each rod, so that it will not interfere or clog the machine. Similar operations go on upon each side of the machine. A little rotary pump keeps the work flooded with oil, the base of the machine forming an oil tank. The double machine as shown, makes 7,000 bicycle chain studs in ten hours. For rollers or pieces that require drilling, the operation is usually somewhat slower. The knee can be run back for inspecting or gaging work, and all parts of the machine are easily accessible.

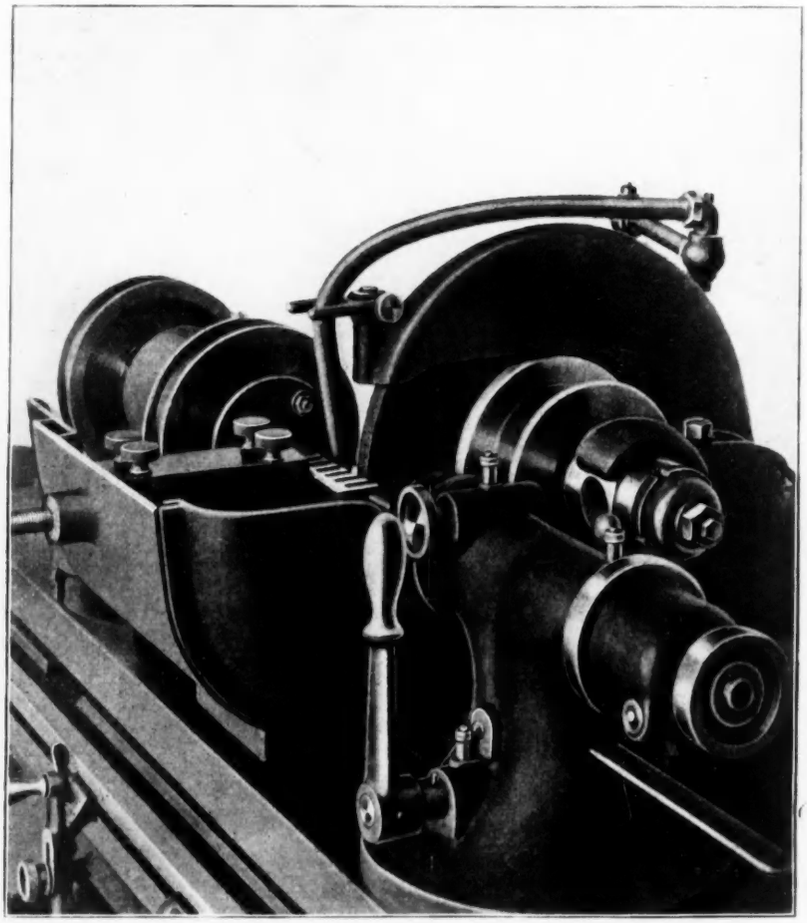


Fig. 4. GRINDING TAPER PIECES.

## Machine Grinding—II.

BY C. H. NORTON.

To obtain the best results from the grinding machine, it should be well supplied with fixtures for doing different kinds of work. The makers are very generous in their attachments, but even if they were disposed to supply them, it would be impossible for them to know all about every shop's needs, and what is required to do its work in the grinding machine. I have seen much work done at a disadvantage because the arrangement furnished by the makers was not suitable for the job, although just the thing for its intended use. It would be just as sensible for a shop to always get on without a universal chuck because the lathe-maker did not furnish one with his lathe. It is probably true that no other machine tool is so lavishly furnished with fixtures included in the price as the grinding machine. We all expect to supply the milling machine and lathe with the necessary tools; we supply a different tool for nearly every piece of work done, while we expect one wheel, one follow rest, one water guard, etc., to answer in the grinding machine for all kinds of work.

Fig. 4 shows a machine fitted for handling large numbers of a certain line of work. The pieces to be ground were tapering a small amount, so that a follow rest could not be used. If a few only were to be ground no rest would be required, but it became necessary, when deep and rapid cuts were taken and accuracy of size was required, for it is true that the ability of the wheel to maintain duplicate measurements is greatly increased if the work is kept steady under the cut. Where work is being ground satisfactorily as to surface without support, if supported it will be found that the wheel will duplicate the size more surely. This is because the vibration, although not enough to make bad work, is yet sufficient to slightly crumble the surface of the wheel.

Vibration or "chatter" of the work is the cause of much trouble if the means for avoiding it are not understood. A well planned and made machine is provided with sufficient speed changes to overcome this trouble. Should a piece of work show a mottled, spiral, or "chattered" surface, a change of speed of the work will usually cure it. But if a radical defect exists in the wheel, nothing can be done to remedy the difficulty except to provide a suitable wheel. The wheel journals must also be a very tight fit in the boxes, and there should never be a hump of lacing in the wheel belt, no matter how heavy the machine may be. Rivets are also bad. The belt should be spliced, glued, and sewed smoothly with soft lacing. The machine must also be well made to prevent vibration of its own parts. The most common difficulty, however, is the vibration of the work itself.

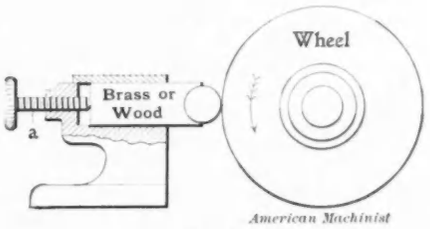



Fig. 5

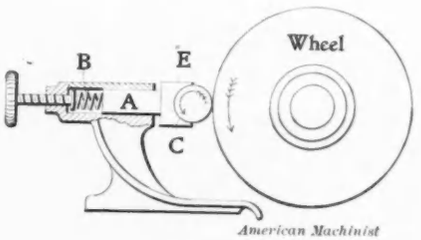



Fig. 6

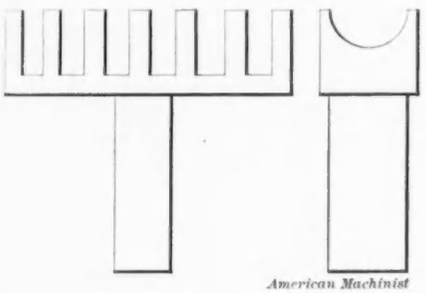



Fig. 7

STEADY RESTS.

In addition to the change of speeds it is necessary many times to use a steady rest. There are two distinct kinds of steady rests; one is known as the follow rest, the other as the spring rest. The follow rest remains opposite the cutting point of the wheel. The spring rest remains at the same point of the work regardless of the position of the wheel. If the work is to be straight and is long, the follow rest is best. Remaining as it does a fixed distance from the wheel, it serves to size the work, thus enabling us to grind slim work

straight, that would otherwise be forced from the wheel and made to "chatter." There is another use for the follow rest; the sag of the bar sometimes causes it to grind large in the center. This is something over which the machine can have no control. The operator must help it by manipulating the steady rest, giving it sufficient pressure to hold it against the wheel at that point. Small work will often be forced away from the wheel by its cut when near the center, so that a rest is necessary even though no vibration is possible. This refers to a small difference in size between the center and ends. With the follow rest it is possible to always bear upon the surface that has been ground. If the work is to be taper the follow rest cannot be used. This is where the spring rest comes in. The reader will readily see that, this rest remaining in a fixed position relative to the work, must bear upon one point of the work only; and that before the piece is ground at all it will press against the surface as the lathe left it, which may be eccentric, and never just round. Now, if it were rigid like the follow rest, Fig. 5, and moved against the work by the screw *A* as shown, it would fail to reach the work as soon as the wheel had cut away the surface. This would cause a chatter until it could be forced against the new diameter; it would then be very difficult to do so without changing the size of the cut. There are certain imperfections also that might be left by the lathe, that would prevent round grinding if this rest was forced against it as the follow rest is.

Fig. 6 shows a section through a spring rest. The shoe *A* is made of brass, the end *E* is made to approximately fit the work to be ground. The spring *B* presses the shoe against the work, causing it to follow the work and keep close in contact with it. The work, when revolving, endeavors to climb up on the shoe, keeping the pressure upon the surface *C*; thus the bar is supported on the underside. The spring allows the rest to conform to considerable variation in size of work, and also allows the work to be eccentric. The shoe of both this and the follow-rest should be made of brass or wood in order that the revolving work may wear it away enough to always fit the constantly varying size. Brass is best as a rule, but wood is used when brass is found to scratch the surface, as it sometimes will. The shoe should have sufficient surface to last well, but not so much as to retard the wear mentioned above. When extraordinary steadiness is required, a shoe like Fig. 7 should be used. One like this is shown in position on the work in Fig. 4. The shoe for spring rest should always be of sufficient mass to absorb small vibrations, but should move freely in its slide, the spring keeping it in touch with the work. The pressure is regulated by the thumb-screw. When such a shoe is fitted up it should first bear on the underside of work well. The wear will soon fit it to the work and it will always be firm underneath. The cuts shown in Figs. 7 and 9 are made to reduce surface and maintain the fit; also to allow free flow of water around the work. Shoes should never be V-shape. The reader will no doubt see why a V would not give round work in every case.

Fig. 8. GRINDING A LONG CURVED STEEL TUBE.

An interesting example of this form of steady rest is shown in Fig. 8. The work here is a long steel tube of curved contour, being much larger at one end than the other, so that a follow rest could not be used. Being a tube it was very difficult to grind without the best support. Fig. 9 shows the form of the sliding weight. Wood was inserted to bear upon the tube; the whole moved very loosely in a guide, the spring in center of each sliding weight keeping the shoe against the tube. These weights were about thirty pounds each; this, resting upon a sliding surface, absorbed all jar and the tube was ground easily.

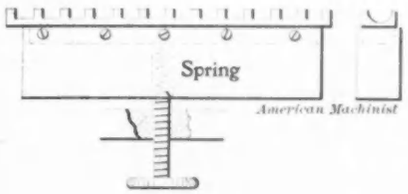



Fig. 9

FORM OF SHOE.

Fig. 10 is a front view of a machine showing the special water guards. The adjusting screws for spring rests can be seen projecting through the front. Fig. 11 is a rear view of the same outfit. The work in this case being curved must be ground by a form. The edge of the steel former that controls the wheel is the light bar *a* in Fig. 11. Fig. 8 shows the tube resting in the wood shoes.

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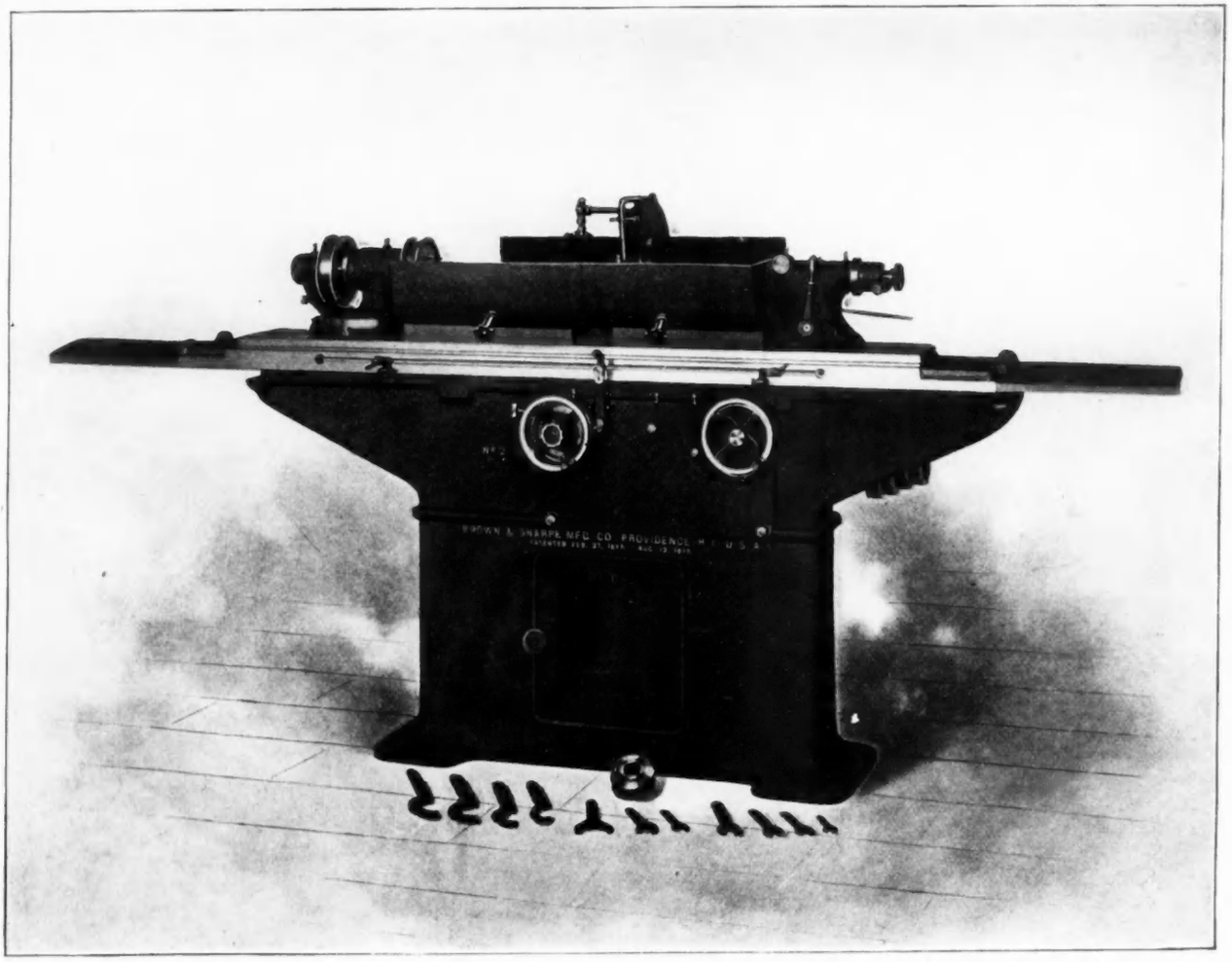
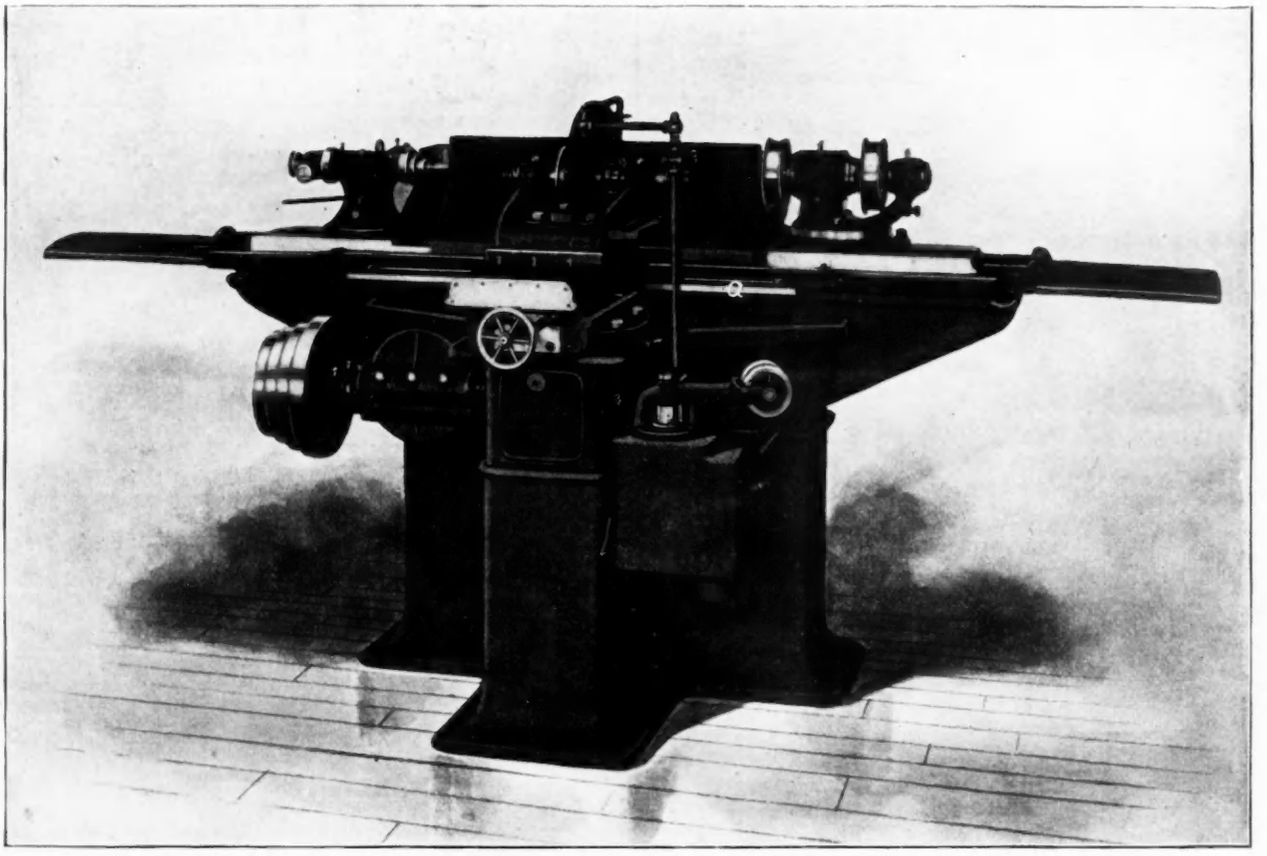
High efficiencies are constantly being shown for the various types of impulse or tangential water wheels. Some tests, made at the Ohio State University, of the "Cascade" wheel give a mean efficiency of 88.77 per cent., the range being only between 87.06 and 91.85. The water pressure used was about 70 pounds, or 160 feet head, and the revolutions of the wheels about 320 for 38 inches and 425 for 26 inches, the former developing about 75 brake horse-power and the latter about 40.



Figs. 10 and 11. GRINDING CURVED PIECES.

## The World's Aluminum Output.

Hon. Eugene Germain, United States Consul at Zurich, has forwarded to the State Department the following report, relative to the world's output of aluminum:

The aluminum production in the different countries, together with the horse-power employed and the daily capacity of each plant, is given in the following table:

| | H. P. | —Av. Daily Product.— Kilos. | Lbs. |
|---|---|---|---|
| United States of America: | | | |
| Pittsburg Reducing Company, Works at Kensington, Pa..... | 1,600 | 906 | 1,993 |
| Works at Niagara Falls, N. Y... | 1,600 | 1,000 | 2,200 |
| Switzerland: | | | |
| Alum. Ind. Gesellschaft Neuhausen..... | 4,000 | 2,270 | 4,994 |
| France: | | | |
| Société Electr. Met. France, at Lapraz..... | 2,500 | 1,360 | 2,992 |
| Société Ind. de l'Alum. at St. Michael..... | 2,000 | 1,134 | 2,495 |
| Total..... | 11,700 | 6,670 | 14,674 |

This is almost 6,700 kilos (14,700 pounds), giving at present an annual production of about 2,000 metric tons. The output during 1895 was about 1,200 metric tons. A considerable reduction in the price of aluminum, on account of the new additions and increased horse-power capacities in course of construction in works now in operation, and the contemplated erection of new plants, is imminent. In Great Britain, the British Aluminum Company has purchased the Irish bauxite pits for the purpose of manufacturing aluminum at Larne Harbor, near Belfast. The same company has bought water rights at Foyer's Falls, Scotland, where a 4,000 horse-power is at its disposition.

The newly made addition to the "Neuhausen" Works, which is to be operated by the Heroult system, will, when in operation, add 2,700 kilos (5,940 pounds) to its daily production. A German-American syndicate have projected the erection of works for the manufacture of aluminum, at the Falls of Sarpfoss, in Norway. The water-power disposable there, it is estimated, produce 10,000 horse-power, and the plant is to be ready for operation sometime in 1898. If they utilize 5,000 horse-power, a daily production of 3,000 kilos will result.

Further, the "Neuhausen" Company is building new works with water-power to produce a 10,000 horse-power, at Rheinfelden, Switzerland, and has also acquired water rights for similar purposes at Lend, near Gastein, Austria.

These new additions (Rheinfelden, 6,000 horse-power; Foyer's Falls, 3,000 horse-power; Sarpfoss Falls, 5,000 horse-power), as well as the increased horse-power facilities, projected for the plants now in existence, for 1897-98 (Niagara Falls increase of 7,100 horse-power; St. Michael, 4,000 horse-power), will in the year 1898, with an aggregate capacity for all the plants of 33,000 horse-power, turn out an average of 19,300 kilos (42,460 pounds) daily, or 5,790 metric tons annually. It becomes, therefore, evident that the price of aluminum will fall.

## Fixture for Milling Circular Work.

BY ED. SNYDER.

About two years back an order was placed with the firm with which the writer is connected, to do the machine work on a large number of sprockets and cranks. These were of the kind known as combination or "spider," and as these sprockets were to be finished on the inside of the rim as well as the outside, it was found rather difficult to hold them so as to be turned. The rims were very light, and the tool would "grab" at any places that were not uniform and bend the work. Well, as the number of elliptical sprockets (not all the same ellipse) rapidly increased, it was deemed necessary to adopt some other means of machining; so the writer was instructed to go ahead and design a device for milling them.

Fig. 1 is a view of the device, looking directly down upon it. The length of the bed is 12½ x 10¼ inches wide, and was designed to be used on a No. 2 plain miller (Garvin), although it can be used on almost any miller on which the feed rod is on the left-hand side.

The upper portion of Fig. 2 is a section through *C D* of Fig. 1, and the lower part of Fig. 2 is a section through *E F* of Fig. 1.

Fig. 3 is a section through *A B*, Fig. 1, with worm wheel broken away to show the means of taking up wear, and also the device in which the block *b'* of Fig. 2 is contained; *b'* supports the outer end of milling arbor, and is a great help on heavy work. This fixture is clamped on the table of the machine, both spindles being parallel.

The feed rod of the miller is detached and coupled to shaft *d*, and an adjustable stop placed on the longitudinal slide of the miller; this stop is not necessary when straddle milling is done, as when work is to be placed in or removed from the fixture, the knee is lowered sufficiently to clear the cutters. The screw *s* (Figs. 1

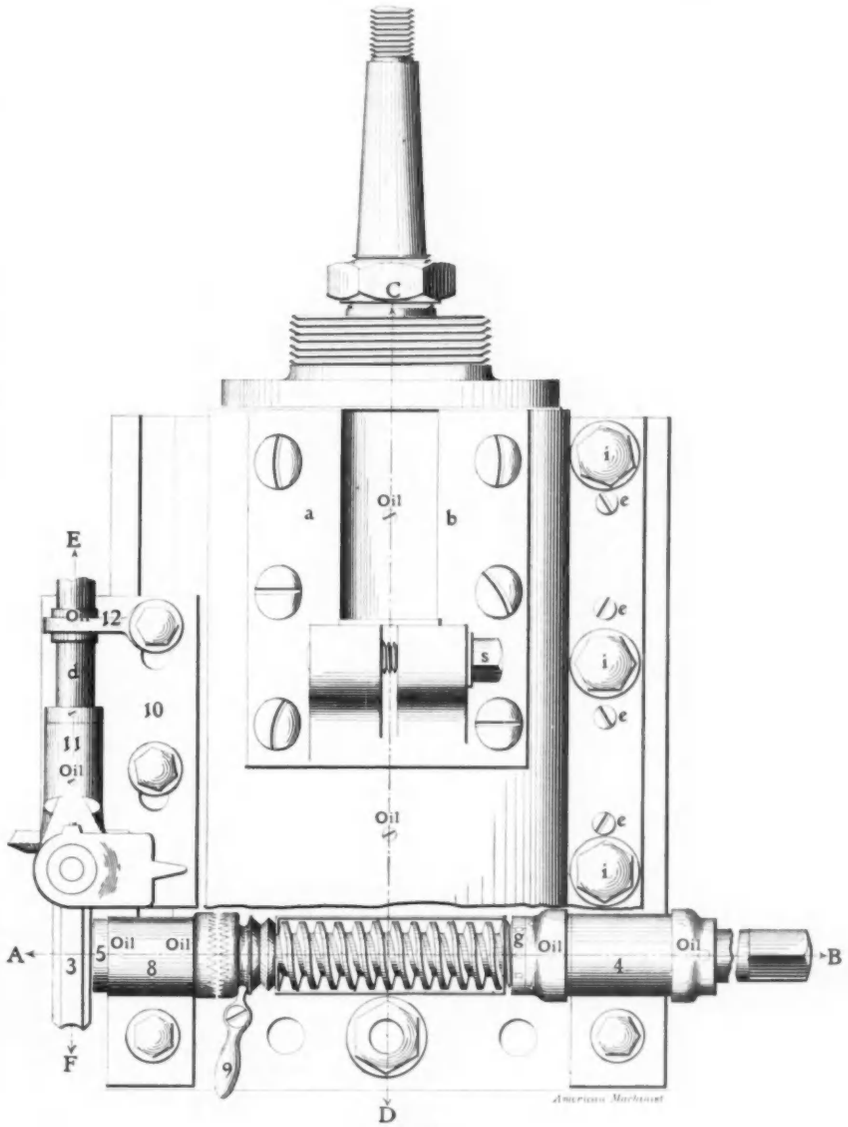



Fig. 1

PLAN OF CIRCULAR MILLING FIXTURE.

and 3) is used to bind the part *a* and *b* tightly on block *b'* after the cutters are into the work a sufficient depth.

The spindle *S* is of cast iron, 4 inches diameter and 9¼ inches long in the bearing. The thread on head end is used for special holders when sprockets or segments are to be milled, and the taper hole in spindle is the same as in the large-sized Garvin universal head. The screw *l* is not absolutely necessary, but is used as a matter of safety when doing heavy work.

The worm wheel *w* is a tight fit on the spindle, and is keyed to it by a straight key; this gear is held in place by an adjustable nut *n*, which, when properly adjusted, is locked by small screw *o*, between which and the thread on the spindle is a copper plug. Two hard brass washers are placed between *w* and *h* and *m* and *h* to prevent abrasion, as it was found necessary to adjust nut *n* very tight on some work. Screws *i i i* are used for adjustment, and screws *e e e e* for a lock against *i i i*. Legs *r* and *r'* extend from *t* to *t'*, and are joined in center by web *v*, Fig. 2. The worm for rotating *w* is of steel, and runs in an oil pan, as shown in Fig. 1. All the working parts are protected by a metal case, so arranged as to be easily removed. The worm *k* is squared on outer end to receive a wrench, as it is necessary on some work to feed the fixture backward, especially on segments when machined in a holder. The excessive friction on worm due to end-thrust was overcome by means of ball-bearings; one bearing is pinned to worm *k*, the other is adjustable and is locked by nut *g*. Rings of hardened steel are placed on either side of casting 4, and are prevented from turning by small pins, two in each. The worm wheel 3 is in motion as soon as the miller is started. This wheel can be removed in case a different feed is desired. It is fast on hollow spindle 5, by means of a nut and key. 6 is a clutch and is pinned to 5; 7 is the movable part of clutch, and is prevented from revolving on *k* by a feather. After setting the cutters in to the proper depth, handle 9 (Fig. 1) is moved to right, and clutch 7 engages with 6 and puts in motion the main spindle of the fixture through *k* and *w*. Clutch 7 is held in mesh with 6 by spring plunger *x*, Fig. 3. The teeth of these clutches have an angle of 15 degrees on a side, and at this angle do not show any inclination to spread apart.

The casting 10 carries the worm, pinion, gear and yoke 11, and can be adjusted to or from spindle 5 so as to allow different-sized gears to be placed on spindle 5. The small bracket 12 prevents any vibration of the feed shaft, and is replaced by either one of two others—one when the fixture is placed at any angle between 30 degrees and 60 degrees, and the other when the fixture is at any angle between 60 degrees and 90 degrees. The yoke 11, worm pinion and gear are free to swing in the bearings 13 and 14 (Fig. 2) when released from bracket 12. In the feed mechanism there is nothing to prevent rotating the spindle of the fixture in either direction, as in some kind of work it is more satisfactory to have the cutters cut down, especially where the rim of a wheel is very light.

To this shop (C. W. Crary & Sons Co.), doing a great variety of work, especially gears, this fixture has proven a money-saver, as it can be operated at a small cost, and yet produce accurate work. The writer does not contend that this fixture will compete with a special gear-blank milling machine, but trial has shown that it will turn out 100 per cent. more work than an engine lathe, and more uniform.

Chicago.

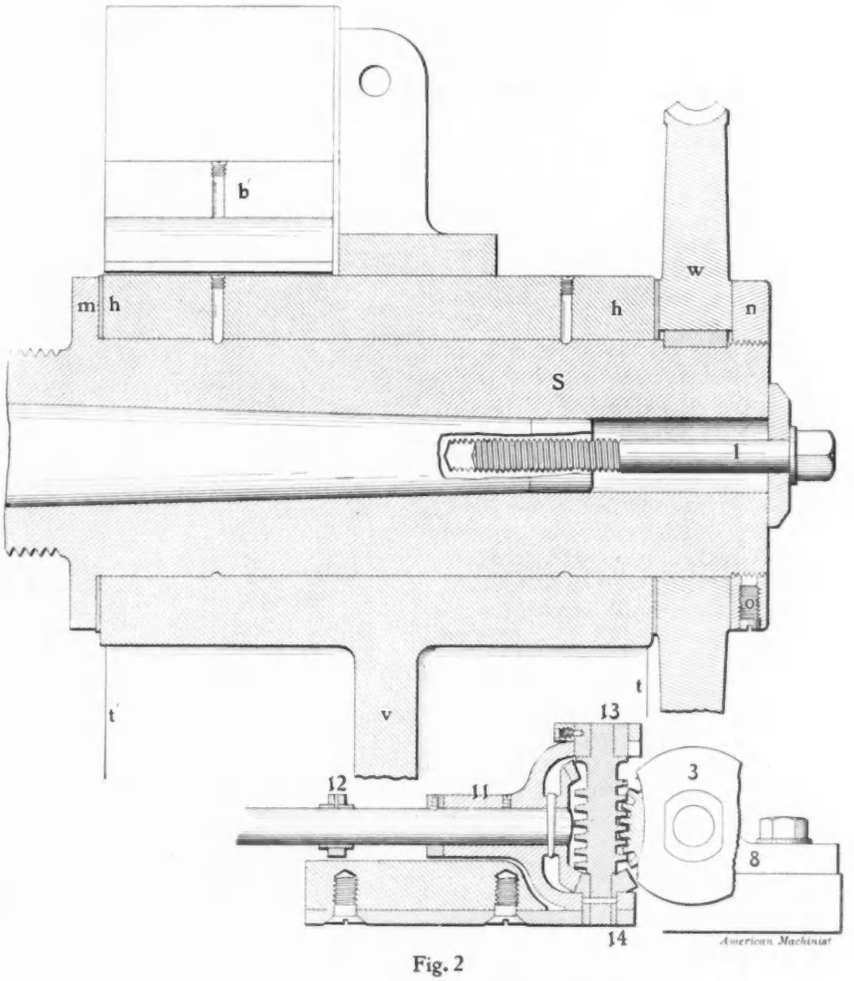



Fig. 2

SECTIONS ON CD AND EF OF FIG. 1.

## A European Distributing Center for American Machinery.

To U. S. Consul H. P. Morris, at Ghent, Belgium, we are indebted for some practical suggestions that are worthy of earnest consideration. In his latest report to the State Department he calls attention to the fact that American labor-saving machinery in all branches of industry is taking the lead throughout the world of manufactures. The reasons for this are, the quality of the material employed, the superiority of workmanship, excellence of finish, and prices which steadily and easily compete with the best European productions. Not alone to these causes, but the generally good reputation of our mechanical inventions is widespread. While this is a fact, it is also a fact that there are details of many individual inventions that are entirely unknown, and frequently when the attention of Europeans is called to some labor-saving device, the reply is made that it has never been heard of before.

Optical demonstration of the practical usefulness and economy of any appliance is nearly always necessary to induce a European manufacturer to investigate. England has catered to this fact, and has a great advantage over the United States on account of location, and we must not forget that it is with England that we have to compete for European trade in machinery. The English manufacturer opens up a showroom in his own establishment and invites his Continental cousins to come and inspect his machines. If the amount to be saved by the adoption of some process or appliance is of any importance, the possible Continental purchaser will readily agree to make the

requisite trip to England to investigate, and if he is convinced he is that manufacturer's client thereafter.

This is the point at which we are at a disadvantage; a possible purchaser will not go so far from home, as a rule, to make his purchases. It is a fact that we have been slow to grasp, but one that is nevertheless true, that we must take our wares where we hope to make our trade if we ever intend to extend our trade outside our own borders; if we want domestic prosperity we must compete for foreign markets. The Continental field is not only still open for American goods, but for British trade; as a distributing point for Continental trade, we would be brought into direct competition with the British manufacturer in his own markets, where he has the advantage of being at home.

Paris is better from some points of view. It is nearer to the center of the Continent; is at the heart of the French people who admire anything that bears the name "American." But we desire to enter our goods into Germany, for without German markets the attempt to reach European consumers would only be half completed. Germans will not, from

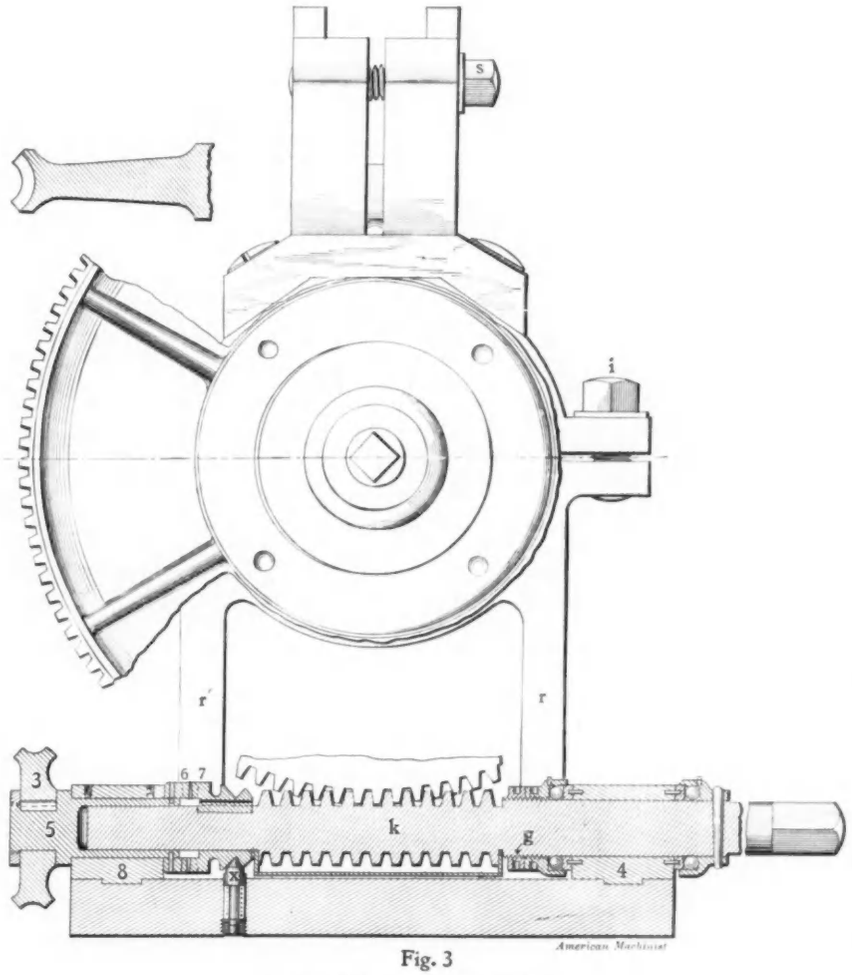



Fig. 3

SECTION ON A B OF FIG. 1.

is, to a great extent, an unexplored, unworked field, awaiting the first occupant.

The best way to overcome the difficulty of distance is to open up headquarters for American goods in some Continental city. Where shall it be? It must be a city that stands at the gateway of the Continental markets, and must be easy of access from America; and yet it must be in the midst of an industrial region, and must at the same time be the best distributing point for other countries on the Continent. Only four cities present themselves as a solution of this problem—London, Paris, Berlin and Brussels. London would only be suitable as a center choice, go to the capital of a country that they recognize as their great Continental rival; it would therefore be impossible to work through Paris for the markets of any other than Latin Europe, for by so doing we would not only cut off the markets of Germany, but also those of Russia, Belgium and Roumania.

Berlin would be a more desirable center than Paris, but the same objections that obtain with respect to Paris remain with regard to Berlin on the reverse side, and the necessity presents itself for a neutral ground, and only at Brussels can this be obtained. We have direct lines of steamers carrying machinery from all American ports to Antwerp and Rotterdam in from twelve to fifteen days, and here is the place where German and French merchants will meet in a friendly spirit which need not be harrowed by the thought that by increasing its trade importance they are in any way giving strength to a rival. Brussels is only a short distance from the great manufacturing centers of Northern France and from North Germany. Belgium is a center of Continental industry. Belgian manufacturers are willing and anxious to adopt any ideas, provided it can be proved that they are of the very best; and not only the manufacturers, but 6,500,000 inhabitants of Belgium are ready to welcome our products, goods and manufactures. The field is open, and through this gateway our trade may pass into the larger and broader domain of the entire Continent.

▲ ▲ ▲

## Repairs of Electrical Machinery, Brush Holders.

BY A. R. HARRIS.

In modern machines the construction of the brush holders is such that very little trouble is experienced with them, but in the older apparatus, of which a considerable amount is still in use, this part is frequently the source of annoyance, and sometimes serious trouble. Truthfully speaking, it cannot be said that the commutator and its brushes reached a thoroughly satisfactory stage until the introduction of carbon, and woven wire brushes. Previous to that time, no matter how free from sparks the brushes might be, the commutator would be sure to cut and wear out at a rate that rendered its renewal a rather expensive matter—in fact, the principal part of the total expenses of repairs. With either woven wire or carbon brushes, the wear of the commutator is reduced to such an extent that, if the sparking is not excessive, it will not exceed one or two hundredths of an inch per year.

Many of the old-style brush holders are so made that they do not properly support the brush, and on this account render it difficult to adjust them to the non-sparking point. This defect can be illustrated by the aid of Fig. 1, in which it will be seen that the holder is quite a distance away from the surface of the commutator. Owing to a belief that was formerly entertained, that unless the brushes were very elastically supported, they would chatter, and bounce off the commutator, it was thought that locating the holder at a considerable distance from the surface of the commutator, and allowing the brush to project unsupported, would be advantageous. Experience, however, has shown that such is not the case, for unless the brush itself is decidedly stiff, the friction of its end against the commutator will drag it around in the direction of rotation as indicated by the

dotted lines. The more it is pulled around the tighter it becomes wedged, and the greater the friction—hence, the greater the wear. This is not the only difficulty, but, as will be seen from the figure, the position of contact is also shifted forward, and therefore the sparking is increased.

Brush holders of this kind can be greatly improved by attaching to the plate *A* that clamps the brush in place, a piece of spring brass, about No. 20 or No. 22 gage, as shown at *B*, Fig. 2. This plate should extend to within about one-quarter of an inch of the end of the brush,

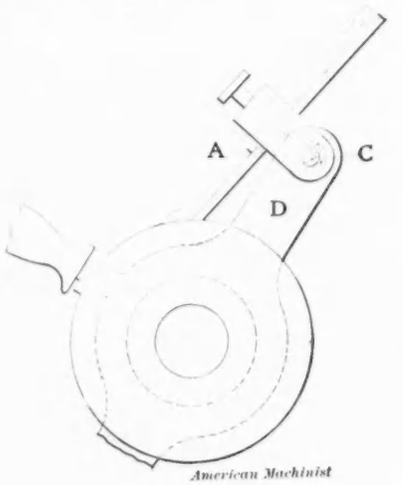



Fig. 1

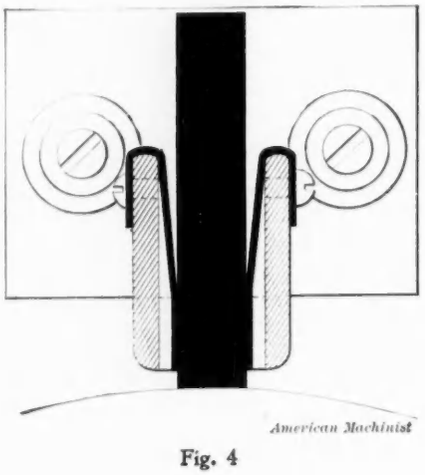



Fig. 4

Sheet metal brushes should be discarded, and either woven wire or carbon used. The latter are in most cases preferable, as they work just as well as the others, do not wear down the commutator any more, and, in addition, are much cheaper. They cannot, however be used in every case, owing to the fact that their current-carrying capacity is considerably less than that of copper, and therefore the brush holders may not be large enough to admit of using the proper size. The cross section of carbon brushes should be about one inch for every 40 amperes of current.

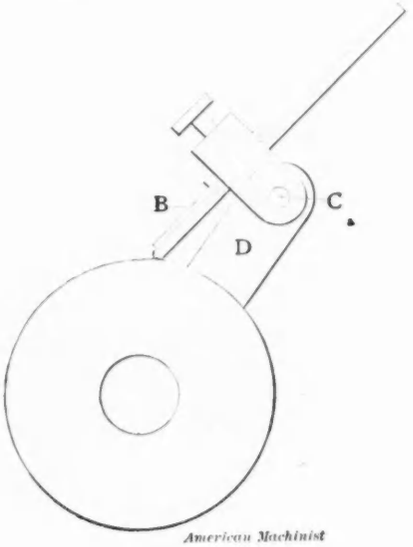



Fig. 2

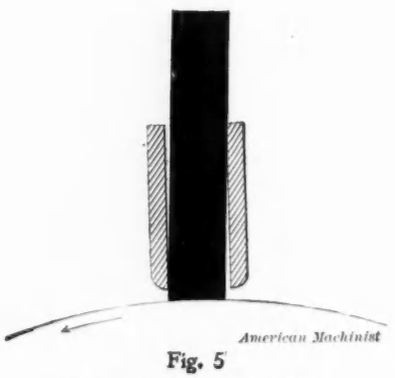



Fig. 5

be made thicker than previously stated, so that it cannot spring. To make up for the lack of elasticity in the brush, a piece of rubber can be placed in the holder, under the brush, and then, as the support on the upper side is the point of the clamping screw, the brush will be able to vibrate to a slight extent, in consequence of the elasticity of the rubber, and thus compensate for any irregularity in the surface of the commutator.

A common defect in holders of the kind shown in Figs. 1 and 2 is, that they

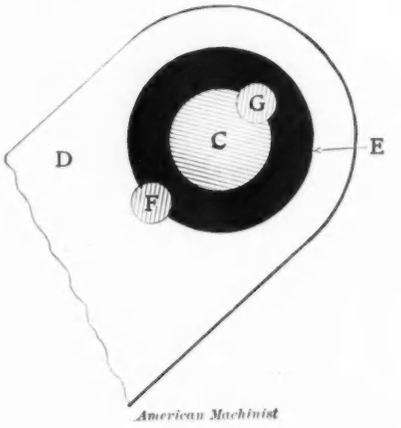



Fig. 3

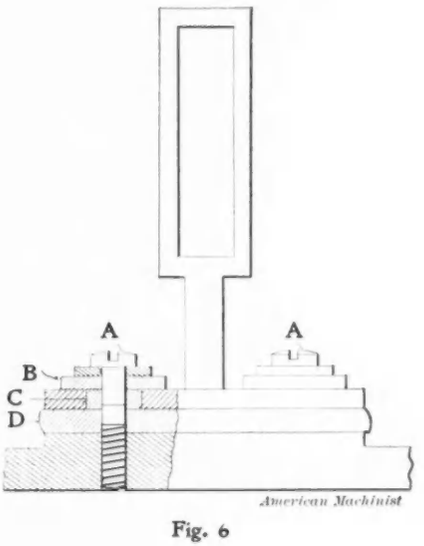



Fig. 6

REPAIRING COMMUTATORS.

when the latter is projected far enough out of the holder to rest on the commutator at an angle of about 45 degrees. As to this angle, at which the brushes should set, it may be well to state that it is not desirable to make it any less than 45 degrees, because by so doing the amount of commutator surface covered is increased, and the effect of this is to increase the sparking and slightly reduce the voltage. A good plan to follow, and one which is very generally used, is to reverse the position of the brushes from time to time, so as to wear off the ends with a taper on both sides like a cold chisel, as shown in Fig. 2.

Brush holders of the type shown in Figs. 1 and 2 are not well adapted to carbon brushes, because as the carbon is not elastic, it will not maintain a continuous contact with the commutator surface, unless the latter runs perfectly true. Another objection is that, as they are rather brittle, they are liable to break off, and if this should occur a considerable amount of damage could be done to the commutator, and to the armature wire at the commutator end, as well, by the excessive sparking that would momentarily take place. Danger of this kind can be almost entirely removed by providing the plate *B*, Fig. 2; but in this case it should

do not hold the brush so that it cannot swing out of place if the nut that secures the stud *C* in the yoke *D* should work loose. The stud is insulated from the yoke, as shown in Fig. 3, by the bushing *E*, and also by two washers, not shown, one on each side of *D*. In many machines the friction between the various parts is all that prevents the stud from rotating, and it naturally follows that if the clamping nut becomes loose, the stud will slip around, and if the position of the brush holder is such that its center of gravity can drop and draw the brush away from the commutator, it will do so. This, as will be seen from the figure, would be

the result if the holder on the lower side of the commutator became loose. When the construction is as explained in the foregoing, it can be improved by inserting two pins, as shown at *F* and *G*, Fig. 3. These pins should be made of hard rubber, or fiber. Their action is so self-evident that it does not require any explanation. They will not prevent the clamping nut from becoming loose, but if it does work loose, the stud *C* will not be able to rotate out of place, and the most that can happen will be that the brush will begin to spark excessively, and an effort to remedy this will at once result in the detection of the looseness of the stud.

The best position in which to hold a carbon brush is perpendicular to the commutator surface, as shown in Fig. 4, and this style of construction is adopted in nearly all modern machines intended for carbon brushes. In some cases the brush is given a slight inclination, it being believed by many that this prevents the humming noise, and also renders the running somewhat smoother; but in any case the deviation from the perpendicular is very slight. The advantage of this type of holder is that the brush is pushed endwise against the commutator, and as the pressure is applied by a spring, the support is elastic, and enables the brush to follow the unevenness of the commutator surface.

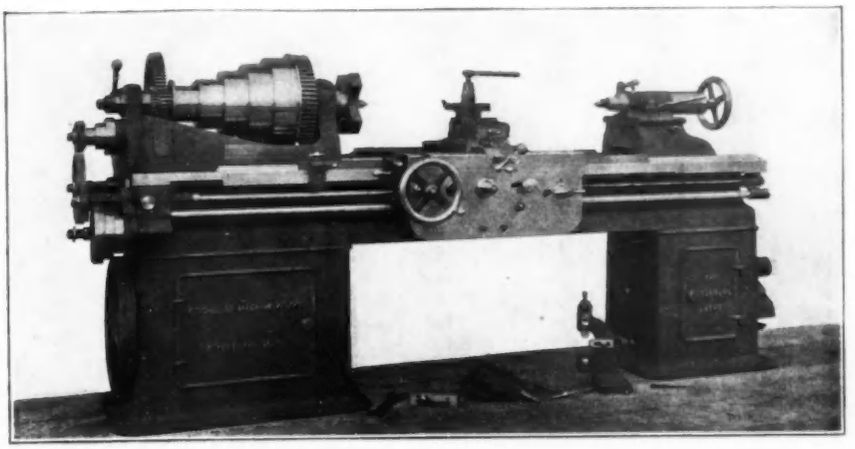
There are two ways of making these holders, each one of which has its supporters. The difference between the two is shown in Figs. 4 and 5. In the former it will be noticed that the brush is held between two springs, while in the latter it is not. Those who use the spring type believe that it prevents the brush from chattering, their argument being that, as the brush cannot be made to fit snugly in the holder, it will wobble back and forth unless the springs are provided. Those who do not use the springs believe that as the commutator rotates continuously in the same direction, the friction at the end of the brush will cause it to assume the position shown in Fig. 5, and that it will stay there. This view appears to be well confirmed by practice. The advantage of the simpler construction, over the spring type, is that the brushes are less liable to stick in the holder, as they do not have to be forced through closely fitting surfaces, and therefore the pressure on the end can be considerably reduced, and still be sufficient to insure a good contact.

Whenever any difficulty is experienced with holders of the variety shown in Fig. 4, in consequence of the brush sticking and thereby failing to feed down fast enough to maintain a perfect contact with the commutator, the experiment of removing the springs can be tried; but in such a case it would be necessary to either use a wider brush, or put a piece of metal in the holder to reduce it to the proper width.

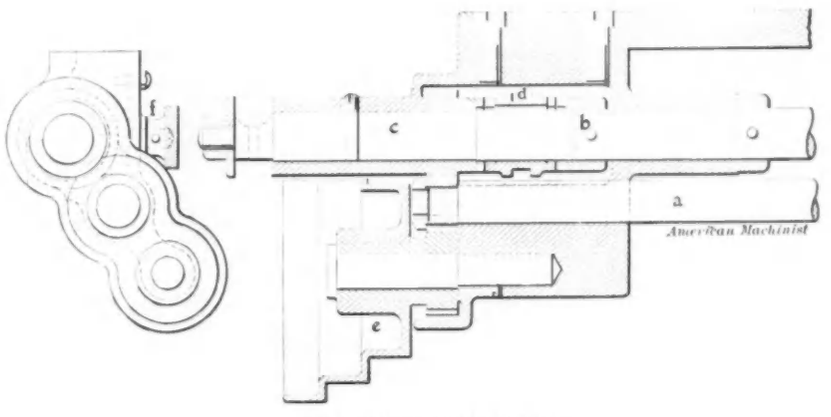
There is seldom any trouble experienced with modern brush holders on account of their becoming loose, but it occasionally happens, especially where the machine is located in a place subject to a considerable amount of moisture, for the insulation between the holder and the supporting frame to give out. A glance at Fig. 6 will show the cause of such trouble. The screws *A* must be insulated from the holder, and this is accomplished by means of the insulation at *B C D*. These three parts may be separate from each other, or *B* and *C* may be in one piece. If they are separate, there will be a joint between *B* and *C*, and another between *C* and *D*. If *B* and *C* are in one piece there will be only one joint; but, in any case, at least one joint will be unavoidable. If moisture collects in these joints, it will form a path over which a current can begin to leak, and as soon as the circuit is established, there will be a rush of current that will burn out the insulation. To prevent this trouble, all that is necessary is to fill the joints with shellac varnish. This should be put on the various parts when they are put in place, and after the screws are tightened the joints should be varnished over again; this course of procedure will remove the difficulty in almost every case.

## Fitchburg 18-inch Lathe.

We illustrate the latest improved lathe put out by the Fitchburg Machine Works, Fitchburg, Mass. This lathe is 18 inches by 8 feet, swinging 11 inches over the carriage and taking 4 feet 1 inch between centers. The largest diameter of the core is 13 inches for 3-inch belt. The lathe is backgeared 11 4-10 to 1, the speeds ranging by uniform steps from 4¼ to 340 revolutions per minute. Feeds on both longitudinal and cross. The Chapman feed gives always ready a roughing feed strongly driven by gearing, and a finishing feed driven by the usual three-step cone pulleys. The lead screw never revolves except for screw cutting. A locking device prevents the lead-screw nut from being locked and the feed engaged at the same time. An automatic and hand stop for the longitudinal feed is provided.



FITCHBURG LATHE WITH CHAPMAN FEED.




CHAPMAN LATHE FEED.

The Chapman feed drive will be understood by reference to Fig. 2. The feed rod *a* is driven by the small three-step cone *e* in the usual way. The lead screw ends at *b*. The spindle *c* carries the feed-screw gear upon its outer end and revolves independently of the screw when the clutch *d* is in the central position shown. The clutch is moved to the right or the left by a slight turn of the knob *f*.

A movement of the clutch to the right engages the lead screw, while a similar turn to the left engages the pinion *g*, which meshes with the pinion upon the feed rod *a* and thus drives the feed strongly and positively. The speed of the feed rod and of the feed is thus only limited by the range of the screw cutting change gears. A list of the feeds which the various gears will cut is furnished. It is intended that the gear drive shall be used for strong, coarse roughing cuts where more power is required, and the belt feed for light work and finishing. When the gear feed is engaged the feed belt is usually slipped off.

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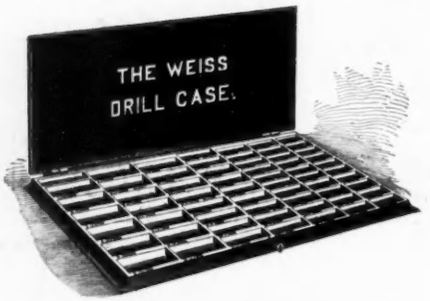
## Case for Small Twist Drills.

The case here shown is for holding small twist drills, and should be a convenience in many tool rooms. It is made of cast iron with a cover that closes without slamming, having a spring-balanced hinge. There are sixty pockets for numbered drills from 0 to 60, the pocket for the former holding 16 and that for the latter size about 200. The pockets are all numbered and the size of each drill is also given in decimals of an inch. It combines also a drill gage, having a hardened and accurately ground steel bushing for each size, and figures also tell the drill to use for all the standard taps. The case is made by Weiss Brothers, 286-290 Graham street, Brooklyn, N. Y.

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# Letters from Practical Men.

## Lathe Spindle Chucks.

Editor American Machinist:

In the issue of March 25th last, in the article entitled "A Gear Blank Arbor," I recognize an old friend, although I have used it in somewhat different forms. I notice the different ways in which it has been used and suggested in the article referred to, and it may be worth while to describe some of the ways in which I have used it.

Instead of threading the arbor or bushing as you have shown, I have made the bushing as in Fig. 1, with an end on it, through which is a hole for a screw. The screw has a collar and shoulder upon one end; a nut with the thread drilled out was put upon this end and driven up against the shoulder, riveted and pinned with a spline pin in the manner shown, the shoulder against which the nut bears being just the proper distance from the collar to allow the screw to turn freely without end shake. This gives a positive motion either way, on or off, and is quite simple and inexpensive. I have found no trouble with one slit through the bushing, provided the bushing fits the hole in the gear blank. I prefer, if there is much variation in the size of the holes of the blanks, to have extra bushings with screw

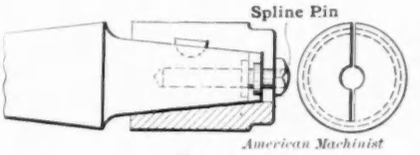


Fig. 1

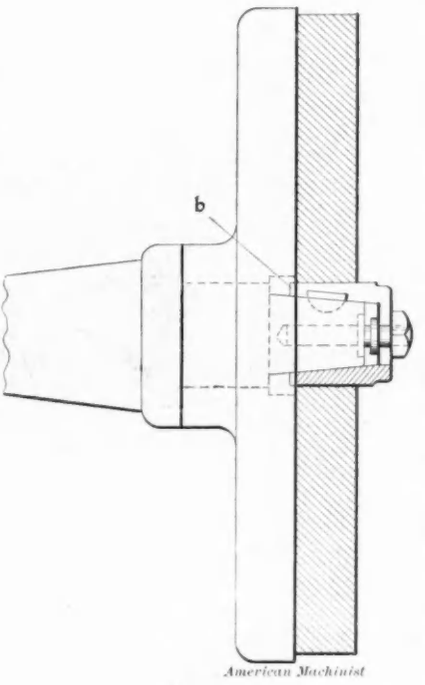


Fig. 2

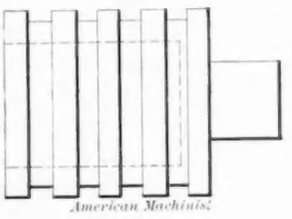


Fig. 3

LATHE SPINDLE CHUCKS.

attached, not attempting to stretch the bushing to holes that are very uneven in size; but a partial revolution of the screw should be necessary to bind it upon the arbor. I always key the bushing on the arbor in the slit as shown. This prevents the screw turning it and helps to preserve its truth, by ensuring its going on again in the same place when taken off.

Many small gears are simple disks of metal, and are often quite thin. It is well, then, to have, when the final turning is done, an arbor with a cast-iron flange or collar forced on, as shown in Fig. 2, and this manner of holding gear or other blanks lends itself completely to this form, as in expanding the bushing by turning the screw a slight endwise movement of the blank takes place, which causes it to be not only tightened on the arbor, but also forced up against the flange. I do not consider this method of holding gear blanks or disks as proper for roughing cuts unless two arbors are used, one each for roughing and finishing.

Gear blanks cannot be too true. This may be an improper expression, as there can be no degrees of comparison for truth, any more than for round or square; but there are different degrees of eccentricity, and the finer they are in a gear blank the better. If they are true, that is better yet, and as to what they should be, I have realized in some shops the full extent of the old saying that "truth is stranger than fiction" fully as much in gear blanks as other things. The roughing cuts are apt to destroy the truth of the arbor to some extent; so after roughing the blanks, put them on the finishing arbor; but keep them back on the bushing far enough so that they will just clear the flange for facing off the first side, then turn them around and put them on so they will be forced up against the flange, which, having been turned true, makes a sure surface to bring the blank up against. The reason I do not bring it up against the flange the first time, is because any slight inaccuracy left after the roughing cut would cause the gear to be sprung from a natural position, and when taken off it would be neither true nor the sides parallel. If when the gear blanks are strung on an arbor to have the teeth cut, one of them has sides which are not parallel, when the nut is tightened the arbor is sprung and the entire string thrown out of truth.

A proper amount of clearance should be left in the flange to allow the bushing to come through the gear blank a little, as shown at *b*, Fig. 2. I have used this method of holding in as many forms as the different shapes of the pieces to be operated upon demanded.

I had at one time a large number of brass pieces, like that shown in Fig. 3, to be turned all over on the outside, and the grooves shown cut in them. For these I used the form shown in Fig. 4. This style falls under the criticism of your "philosopher" as being too far from the end of the spindle, but I think in many cases it will be found sufficiently rigid. It will be seen that this construction was necessary, as the end of the piece was closed.

The screw for binding leads through the knurled nut at the back, near the spindle end, which is tapped out to receive the end of screw at this end, splined to receive the point of a pin driven into the mandrel at this point to prevent screw turning as nut revolves. This hole was

drilled before the arbor was slabbed off. The nut is drilled with four pin holes for turning.

The outer end of screw is arranged very similar to Fig. 1, making the head, which in this case is a thin washer of about ⅛ inch thickness, riveted upon the end of screw, as the nut in Fig. 1. A spline tapered hole fitting the end of the screw. A pin in the face plate and spline in screw prevent turning when binding, as shown at *a*, Fig. 5. This is a handy rig for holding thin cutters, collars, rings, etc. This form may also be used with a tapered projection and means for binding as in Fig. 1. When the knurled nut at the back

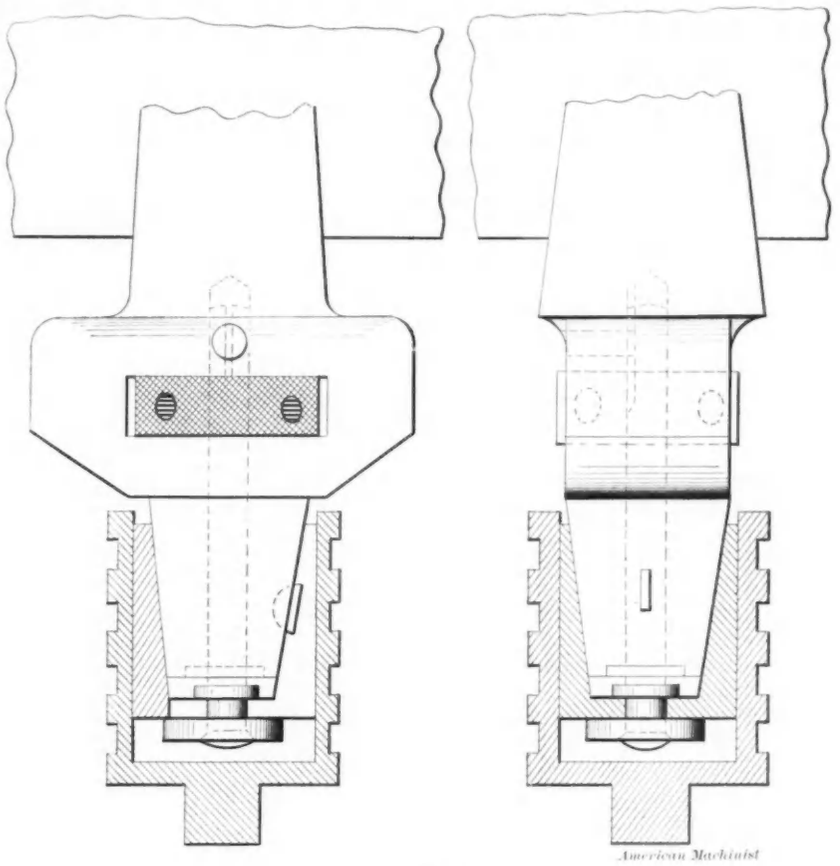


Fig. 4

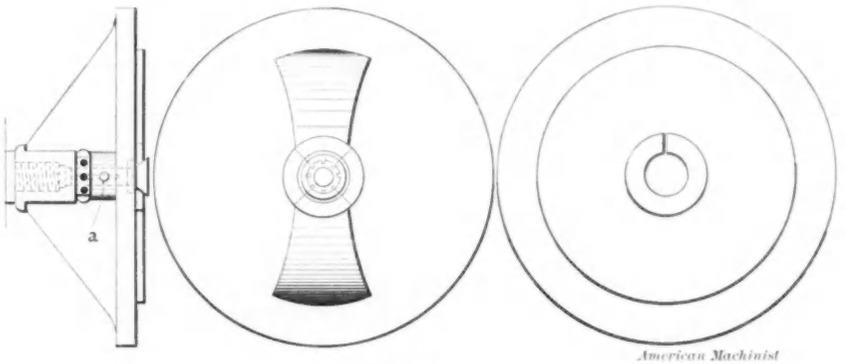


Fig. 5

LATHE SPINDLE CHUCKS.

pin here as in the nut is, of course, unnecessary. When something stiffer is wanted, the form shown in Fig. 5 can be used. This is an iron casting, and screws directly upon the spindle end, and here a long bearing and good fit are made of the screw, so it can become the arbor upon which the blank is turned.

The screw end is tapered as shown and surrounded by a split ring in which is a being out of the way, a still closer approach to the spindle end can be made, which adds still more to its stiffness. For some purposes the flange can be dispensed with. This simplifies it some, as shown in Fig. 6. I have used most of the forms for nine or ten years, and I know they have been used, some of them, before that.

MACHINIST.

## Copying Sketches.

Editor American Machinist:

In your issue of April 22d I notice a suggestion for making reproductions of letter-press copies of sketches. This need has been felt in the drafting room of the Brown & Sharpe Manufacturing Company, as we have often had occasion to use such copies. We make our reproductions in another way, however. Our method is to blueprint any required page of the copy book. We put a sheet of blueprint paper under the page to be copied and a pane of glass over it, and expose it to the sunlight in the same manner as for making ordinary blueprints. In this way any required number of copies can be made, even when the press copy has been made for many years. I inclose a sample showing what results we obtain in this way. It surprised us to find that such clear prints could be obtained, but a partial explanation seems to lie in the fact that in a press copy the ink transferred from the sketch is on the back of the copy-book leaf, and thus, when blueprinting, in direct contact with the prepared surface of the blueprint paper.

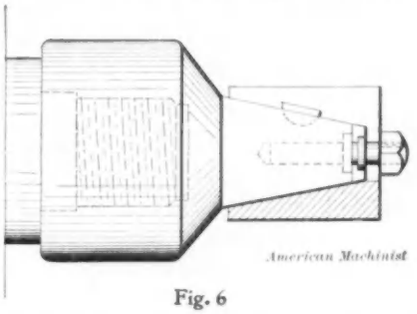


Fig. 6

We make very extensive use of the copy-book, having thousands of sketches and important records preserved in this way. Each book has a complete index. Those who have spent hours in searching through piles of sketches before finding the one wanted, or who have given up the search after both time and patience have been exhausted, will appreciate the advantages of some such systematic method of preserving their sketches. The fact that copies can be cheaply made at any time is an additional advantage worth considering.

L. D. BURLINGAME,
Chief Draftsman, B. & S. Mfg. Co.
Providence, R. I.

[The blueprint copies sent by Mr. Burlingame with the above are perfectly clear and legible, and in every way satisfactory. —Ed.]

▲ ▲ ▲

## Cutting Standard Screw Threads.

Editor American Machinist:

In answer to Question No. 33, in the "American Machinist," March 25th, your remark as to flattening the screw thread one-eighth of the pitch is somewhat misleading. Do you not mean one-eighth of the total depth of the V, which is ap-

proximately one-tenth of the pitch, as your correspondent suggests. J. L.

Toronto.

[The above is not our meaning. In the first place, the nominal external diameter of the screw should also be the actual diameter of the finished screw. The flat remaining at the apex of the thread, both at the top and at the bottom, should be one-eighth of the pitch, and it should be measured on a line parallel to the axis of the screw. If the pitch of the screw was ⅛ inch, then the width of the flat, both at the top and at the bottom, should be ⅛ × ⅛ = 1-64 inch. To cut a 1-inch screw, 8 threads to the inch, or ⅛-inch pitch, the blank should be turned 1 inch diameter, the V tool should be ground to an angle of 60 degrees, the point should be ground off leaving a flat 1-64 inch wide, and the thread should be cut to such a depth as to leave a flat space 1-64 inch wide upon the outer points of the threads. No reference to the hight or the depth of the thread, either slant or perpendicular, is involved in the case, and any such reference is quite apt to be misleading. If it is necessary to know the actual diameter of the bottom of the male thread under the above conditions, the formula is:

$$\text{Diameter of bolt} - \frac{1.299}{\text{No. threads per inch.}}$$

Thus the diameter of the bottom of the thread of a standard 1-inch screw will be:

$$1 - \frac{1.299}{8} = 0.8375 \text{ inch}$$

The thread is not first cut sharp both at the top and at the bottom, afterwards flatting off the top and filling in the bottom, because, while we might do the first operation, we could not do the other, so we do neither, but cut the thread in such a way that the flat top and bottom will be secured by the regular operation of cutting without any doctoring afterwards.]

▲ ▲ ▲

## Centering Lathe Work.

Editor American Machinist:

The accompanying sketches show a method of centering work for turning which has been used with marked success, both as to time required and quality of work produced.

Fig. 1 represents a lathe chuck holding a piece of cast iron with a conical recess turned in it, a little larger than the piece of iron or steel to be centered; the remainder of the sketches will be quite plain to the practical machinist who has ever made use of the square center for the same purpose. The drill is made flat, and is a continuation of the countersink, which is also flat, with cutting edges on the sides as well as end.

The drill is held in a socket made for the purpose, or in the ordinary drill chuck in the dead spindle of the lathe. The point of the drill should be tempered a little above spring temper to insure a degree of elasticity. After adjusting the V-rest to bring the iron or steel to be centered into the right position, with the lathe running, the end of the piece *C*, held by the left hand, is placed in the conical cavity *B* and against the rest *D*, the right hand feeding the drill against the piece. The friction in the cone being greater than at the drill, will cause it to revolve. As soon as the drill begins to cut, the left hand will be at liberty to regulate the rest *D* by the cross-feed screw or the back elevating screw. Care should be taken in starting that the rest *D* is a little back of its proper position and brought up after starting until the piece runs true. The lathe need not be stopped to change ends, for the instant that the pressure of the drill is relieved, the piece *C* stops, and should be grasped by the left hand before drawing out the drill.

It will be seen that by this method the center is finished at one operation, and need not require any more time than the simple drilling in the ordinary way, after marking for position.

By having a side cutting edge to the drill, another advantage is that such work as cold-rolled steel shafting can be centered perfectly true, and ordinary round steel as near as 1-64 of an inch. Pieces that would require two to handle in the ordinary way, have been centered by one alone in this way, and as to actual service.

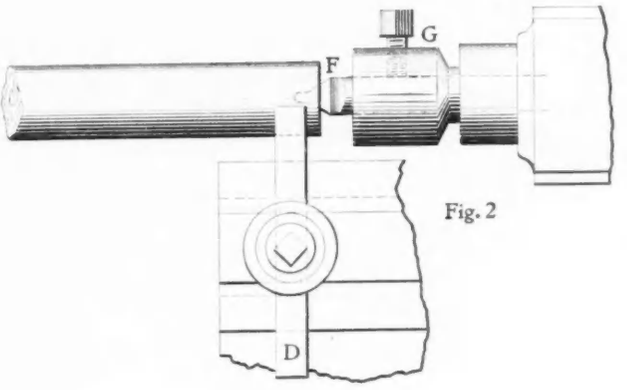

Fig. 2

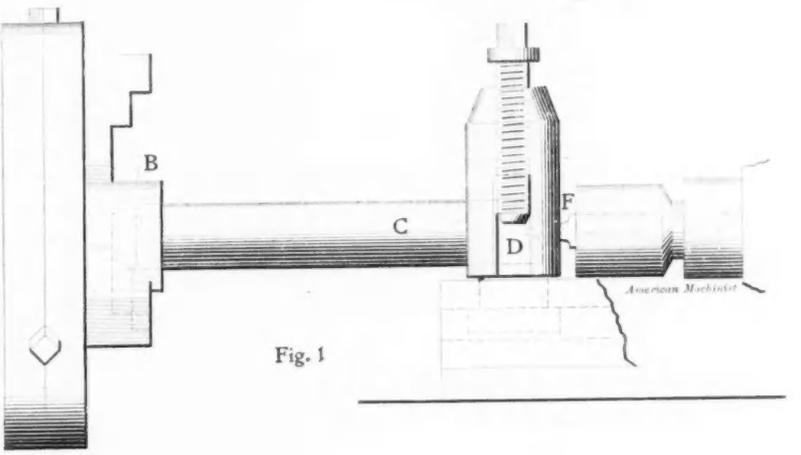

Fig. 1

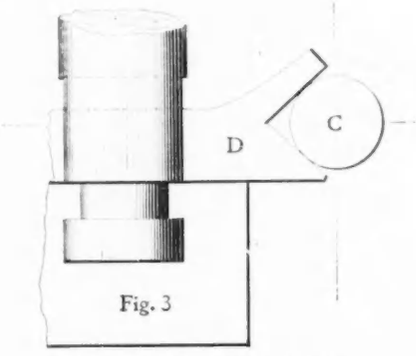

Fig. 3

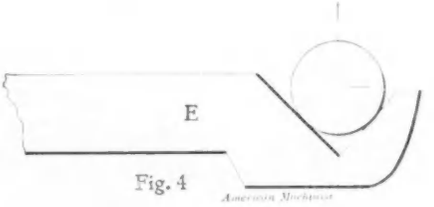

Fig. 4

CENTERING LATHE WORK.

the same drill has been used for four hundred centers in machinery steel. It is a saving of time, when only three or four pieces are to be centered, to use this method, by having a socket for the drill, or with the ordinary drill chuck in the dead spindle, and without the cone casting in the chuck, stopping the lathe for each change.

This method cannot be used to advantage by the careless apprentice, but requires some skill and judgment in the operator, and when there is a large amount of such work to be done, it is economy to let the better man do it. Fig. 5 shows the arrangement for heavy shafts.

O. C. CRANE.

New York City.

## Welded Steel for Dies.

Editor American Machinist:

I wish some of your readers who are die-makers would tell us what kind of steel they have the best success with for die work. I don't mean the make of steel which they use, because that information ought to go in the advertising column; but what I mean is, whether they have better luck with the welded up, half iron and half steel blank, or if they prefer the all steel die. I have tried both kinds, and I haven't made up my mind yet which is the best.

I like the welded up sort all right for small dies, but I never have any trouble with that kind of die when I make it out of bar-steel. It is the big dies that we put the most work into, and that we are most anxious about, that give us the most trouble. The greatest fault that I have to find with the built up stock is, that they don't seem to be able to get a good weld on it. It will be all right around the edges, but after the center is cut out, and the thing is hardened, then the trouble begins. Sometimes I have seen a die get half worn out before the flaw began to show, and then it would keep on extending until the die was not fit to use.

I well remember making a large number of dies from welded stock, and the circus I had with them. They were of the shape of the letter E; in fact, the boys used to call them the "E" dies. The blank was, if I remember correctly, 2 x 14 x 18 inches. The first six were made of welded steel. None of these cracked in hardening, but the trouble which I have just described was so great that the next lot was made of bar-steel. We got a large bar of 2 x 14-inch steel from the mill, specially for the work. Two of these dies cracked in hardening, but the others worked so well that we stuck to that way of making them; I presume it has prejudiced me against welded up steel.

I shall be pleased to get some information on the subject from my brother die-makers, and hope we shall hear from them.

J. L. Lucas.

▲ ▲ ▲

## Cast-Iron Bearings.

Editor American Machinist:

Referring to the discussion on cast iron for bearings, which has been going on in your columns, this is quite an interesting subject to me, for the reason that I became firmly convinced twenty years ago that with very few exceptions a suitable quality of cast iron made the most durable bearings that could be devised, except hardened cast steel. In 1881 we commenced using cast iron for lathe-spindle bearings, at which time we often had customers insist upon bronze or composition bearings. We have always used a special mixture of iron for the purpose, seeking to get an iron that was as hard as we could work to advantage and very fine-grained, and we accomplish this by using a large percentage of selected stove-plate scrap in the mixture. We are pleased to note that the same customers whom we had to persuade to let us use cast iron for this purpose twelve or fifteen years ago, are now in some instances specifying it in their orders, and it is now very rare that we have a call for other than cast-iron bearings. This is, of course, gratifying to us, as showing that our opinion was right. I would add also that our experience has been with lathes, both for heavy work and slow speed, and woodworking lathes running at very high speed.

Cast Iron.

▲ ▲ ▲

## Fair Play for Tool Steel.

Editor American Machinist:

The old saying, "Murder will out," is doubtless true. But perhaps it is just as true that it usually needs a little help to "out."

Some two years ago I took a sample of tool steel to Messrs Fare, Pleigh & Co., for them to try for a certain job of very hard work, which they have to do almost constantly. I was afterwards told that it did pretty well, but not equal to a certain imported brand. Now, I had great faith in the piece of stock I had carried there, and the result was far from satisfactory to me. I therefore came away feeling that the man who had made the test was laughing in his sleeve; I also felt the more downcast because I learned that this man had told the head of the firm that he had found some imported steel that "did not wear out." The head of the firm was not a mechanic, and should therefore be forgiven for repeating the statement. But what bothered me was that if this high-priced imported steel was not going to wear out, it was only a matter of a few months before the concern I worked for would have to go out of business, and I would, of course, have to look for a new situation. And then if that brand of steel "did not wear out," it would only be a matter of a few years before that unfortunate species of human animal, the tool-steel salesman, would be extinct.

But I guess I had better come to the sequel of this matter. Yesterday I went into a machine shop about twenty-five miles from the particular shop where my ambitions had met such a shock, and while talking with an old friend I discovered that one of the other workmen was a man who had formerly worked for Messrs. Fare, Pleigh & Co., and was also an old friend of mine. So I walked over to talk with him, and soon got him to conversing about the shop he had recently left, with a view to learn more about the steel that "did not wear out." I soon learned that my sample only shared the fate of a dozen or more of others. The blacksmith gave it the best treatment he knew how; but when it came to the man on the planer, he saved the sample until he had a cut on the table on which his favorite steel would only stand one notch of feed. That would be considered a good opportunity to test this new steel. So in it would go and the feed would be changed to two or three notches, and, of course, it would not stand the test. So the steel made in the heart of Europe would go back into the clapper and the feed go back to one notch, and the sample put up on the shelf with the rest of the "fakes." No wonder the steel "did not wear out" with one-notch feed.

I guess I have nothing more to say this time, except that, to our own surprise, we are still doing business at the old stand.

A. A. Steelman.

[Mr. Steelman must have struck a strangely organized shop. In the shops with which we are most familiar they are on the lookout for the best steel every time. A planer hand especially appreciates good steel if anyone does, because it always means less work and less worry for him; some of them, perhaps, love the one-tooth feed pretty well, but even that seems to have had no play in this case.—Ed.]

▲ ▲ ▲

## Fastening Emery Cloth on Iron.

Editor American Machinist:

Referring to Question 20 of March 4th, I can say that a very good, if not the best, way of fastening emery cloth to face plates of high-speed lathes is beeswax. The way we have done it was to heat the plate, holding it on the top of a vise so that it could turn freely, by a Bunsen burner until the wax would melt. When the wax was fluid, a sheet of emery-cloth was pressed upon it. When cool, the edges of the cloth were dressed off, and I know of no case where the joint failed; at any rate, it required a good pull to remove the cloth when worn out.

E. Lawrenz.

Troy, N. Y.

▲ ▲ ▲

## No American Machinery to be Used on the Panama Canal.

For a short time it seemed as though the renewal of work on the Panama Canal would mean an opportunity for the introduction of American machinery, and, indeed, a Ledgerwood hoister and carrier cable was bought by the Canal Company and proved to be a complete success, while a French machine, of the same order, purchased a short time later, was far from being satisfactory. However, an order has been issued by the Panama Canal Directorate in Paris, that anything and everything used for work on the canal must be of French manufacture or production, so our manufacturers may as well resign themselves to the inevitable and not waste any more postage in that direction.

AMERICAN MACHINIST

Published every Thursday
by the
American Machinist Publishing Co.,
256 Broadway, New York.

Angus Sinclair, Pres't. John A. Hill, Treas.
C. A. Hansmann, Sec'y.

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## In Behalf of the Slotting Machine.

In our European editorial correspondence it is noted that the slotting machine is more popular and more widely used in England than in the United States. This, it would seem, is at least one particular in which English practice is more correct than our own. The neglect of the slotting machine in our shops is rather unaccountable. It can hardly be that the name of the machine has been the cause of it, as that would apply in England as well as here. The name, however, is a rather misleading one and suggests a function much narrower than the machine actually fulfills. While the machine may have been originally designed and employed for slotting, or for working out the keyholes in connecting rods, and similar work, slotting does not comprise one-quarter of the work for which it may be or actually is employed.

If we could learn to call the machine the vertical shaper, and to think of it as such, the habit of thought might lead to the more general employment of the machine. The horizontal shaper has been well developed and appreciated among us, and has been kept busily at work everywhere. The work which the slotting machine does is almost absolutely identical with that of the shaper. The advantages of the slotting machine for very much of this class of work must be self-evident. Work can be blocked upon the bed or face-plate of the slotter with absolute truth and without possibility of springing or distortion. Where the shaper can work only upon one edge of a piece, the slotter can work all around it with equal facility, and with the certainty that the several sides will be parallel, or square, or otherwise true with each other as required The slotting machine will thus often do at one setting what might require three or four in the shaper to do equally well. The complete slotter, with both tilting and revolving table, commands a range of work much greater than that of the shaper. While the slotter works all around a piece with equal facility, it is impossible for the shaper to do this. The work, whatever is going on, is always plainly visible and accessible upon the slotter; with the shaper the reverse is usually the case. In the case of working to laid-out lines, the slotter has every advantage. With the shaper the laying-out must necessarily be at the back of the work, as it would be impossible to work to any lines or marks where the chips were tearing off. This trouble has led to the invention of the drawstroke planer, the good intentions of the designer of which are not to be quarreled with.

A great variety of work is done, and well done, upon the American shaper, but it would still be well for whoever is using it to remember also the slotter, and to imagine occasionally how a piece of shaper work would look upon the slotting machine, how neatly the tool would walk around it, how perfectly the operation could be constantly watched, and with what nicety the cut could be directed by the operator. It is very certain that many jobs now done on the shaper, and some also done on the planer, belong really to the slotter.

It is not easy to say how far the tool-builders are responsible for the neglect of the slotter, but it would seem that they cannot be entirely innocent. We have all the way along been inclined to give considerable credit to the designers and builders of our lathes, planers, shapers, drills, boring mills, milling machines, turret machines, and soon, not only for the improvements in the machines themselves, but for the improvements in general practice which have accompanied them. While all the machines mentioned above have been continually improved, so that the present condition and performance of them is far in advance of what it once was, who has seen an improvement of the slotting machine in a generation, or what builder is giving any attention to it or making any effort to push it? There would seem to be a promising field here for some enterprising firm to cultivate.

▲ ▲ ▲

## "Data."

We are not grammatical purists, and we certainly do not profess to teach the correct use of language, but there is one grammatical error running through engineering literature, which is so common and which offends the eye and ear of one who realizes its grossness so seriously that we cannot longer refrain from noticing it.

We refer to the use of the word "data," which is undoubtedly the most abused word in the English language, whether native or imported. The word is of Latin origin, its meaning being, facts given. For our purpose this may be abbreviated into facts. It will be seen that the word is plural, its singular being "datum." We have then,

datum=fact;
data=facts;

and if we bear that meaning in mind, the errors will be obvious. These errors consist of ignoring the singular form entirely and using the plural form indifferently in the singular, plural and collective senses, although, curiously enough, in cases where the plural meaning was obviously in the writer's mind, the word is as often as not followed by a singular verb. The use of the word in the collective sense is also incorrect, as it is properly a true plural and not a collective noun.

To lend point to these remarks, we have been, of late, noting instances in which the word was incorrectly used, and in the course of a few weeks have made the following choice collection—quite half of it having come from the writings of college professors or from college publications—for it is a conspicuous fact that the errors in the use of this word are not confined to uneducated or half-educated men. If the reader will supply the meaning of the word "data"—facts, as already stated—he will see how incorrecly the word is used:

The data is in such shape.
Very little data is to be found.
In view of the small amount of data.
Reliable data is remarkably scarce.
The only reliable data we have is that . . .
The data is often conflicting.
The data thus obtained is substituted.
The data is new.
There is not much data to be found.
Much useful data.

The above should read:

The data *are* in such shape.
Very *few* data *are* to be found.
In view of the small *number* of data.
Reliable data *are* remarkably scarce.

The only reliable data we have *are those* . . .

The data *are* often conflicting.

The *datum* thus obtained is substituted.

The *datum* is new (or data *are* new, if more than one datum is referred to).

There *are* not *many* data to be found.

*Many* useful data.

The last expression criticised is particularly common and particularly atrocious. As a specimen of vile grammar, *much facts* could hardly be surpassed in the prize ring.

▲ ▲ ▲

## Technical Books.

**THE MANUAL OF AMERICAN WATERWORKS, 1897. Edited by M. N. Baker; 611 6 x 9-inch pages. The Engineering News Publishing Company. Price $3.**

This volume is the fourth issue of a publication which has become a standard of reference among waterworks engineers and superintendents. It contains an enormous amount of information, giving as it does a brief account of over 3,000 public water supply systems in the United States and Canada. It also gives in tabulated form the water rates charged in 1,250 cities and towns. In the introduction, attention is given to the recent tendencies in waterworks practice. In this connection appears a list of 200 cities and towns in which the ownership of the waterworks has changed from private to public, and another list of reverse changes in 20 cities and towns. In this connection we note that the air lift pump is given the first place among new things in waterworks practice, this pump, it appears, being now in use in several scores of cities. Next to this the gasoline engine appears as a novelty. Both these appliances appear to have met a real demand in the West, where, from the topography of the country, gravity systems of supply are often impracticable.

▲ ▲ ▲

We note in "Engineering News" of May 13th an extremely valuable index to the reports of tests conducted on the Emery testing machine at the Watertown Arsenal. These reports form probably the most valuable records of the strength of materials to be found in this or any other language. The lack of a general index has been supplied by the one here published, which has been prepared by Professor Johnson, of Washington University.

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The official trial of the gunboat "Nashville" makes her the fastest vessel of her class. The average speed was 16.7 knots, and as the required speed was but 13.07 knots, a bonus of $60,000 was earned for her builders, the Newport News Drydock & Shipbuilding Company.

▲ ▲ ▲

A shop in Tacoma, Wash., is building a $100,000 sawmill outfit to go to Delagoa Bay, South Africa.

# Questions and Answers.

**Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer questions by mail.**

(70) H. G. H., Port Tampa City, Fla., asks for information about the material called semi-steel. A.—This material is a special mixture whose composition is not known except by the makers. It is not a true steel. Its properties lie between those of malleable-iron castings and true steel castings.

(71) W. F. L., San Antonio, Tex., asks if it is true that at great depths the water of the sea is so dense that if an ironclad ship were to sink it would never reach the bottom. A.—No. This idea results from a confusion of density and pressure. At great depths the water of the sea is, of course, under tremendous pressure, but its density or weight per cubic foot is but very slightly increased over that at the surface, and a foundered ironclad would undoubtedly go to the bottom.

(72) H. M. P., Wilmington, Del., says that a friend of his, a bicycle agent, claims that a bicycle so constructed as to bring the upper or tight side of the chain to a horizontal line gives a great saving of power over the usual construction in which the forward end is at a higher level than the rear, and he asks if this is true. A.—No; the whole question is simply one of leverage. The claim is, in fact, an illustration of the density of ignorance of mechanical questions among a large class of men whose only, and to them sufficient, source of mechanical knowledge is their pet idol, the bicycle.

(73) F. R. W., Buffalo, N. Y., asks if the Hindley worm could not be made as it is usually supposed to be made, provided the gear were made in halves and the gear entered into the worm by screwing one half into place and then adding the second half. A.—We think that reference to Fig. 11 of the article which appeared in our issue of April 1st will show that this is not possible, and that the difficulty is not, as our correspondent seems to think, in the mere entering of the gear when made in one piece. Our articles show that the cutter head is not a true copy of the worm wheel, but of its medium section only, and it by no means follows that the worm and gear would mesh properly on the plan proposed; in fact, the description attached to Fig. 11 shows this to be impossible.

(74) C. E. K., Watertown, N. Y., says: In generating the curves of epicycloidal gear teeth, which of the following methods is correct—first, to draw the pitch circle of the gear and upon it roll the pitch circle of the pinion for the gear teeth, and then roll the pitch circle of the gear upon the pitch circle of the pinion to form the pinion teeth; or, second, to follow the rule of Molesworth's pocket-book and use for both gears a rolling circle whose diameter is the pitch multiplied by 2.22? A.—The second method is correct. The mathematical requirement for correct action is, that the faces of the teeth of each gear and the flanks of the teeth of the opposite gear shall be described by the same rolling circle. The practical limitations are that the rolling circle shall not be larger than half the diameter of the pinion, and shall not be so small as to make the teeth too pointed in shape, and Molesworth's rule is intended to strike such a mean between these two extremes as to give the best results. There is, however, one case where a rolling circle equal to the diameter of the pinion pitch circle is a correct base for the teeth, and this is for lantern or pin teeth. If in such a case the pinion pitch circle be used for the rolling circle, and gear teeth be made all faces and the pinion teeth all flanks, those flanks will be points. If a pin tooth be set with its center at this point and the face of the gear teeth be made to a curve parallel with that obtained from the rolling circle, and inside of it at a distance equal to the radius of the pin, the action will be correct. In modern gearing the describing circle is made uniform for all gears of the same pitch, chiefly because by following this plan, all gears of the same pitch will mesh properly together.

(75) "Aeromotor" asks (1) for "an estimate of the necessary thickness of material in a steel tank to hold air at 2,000 pounds per square inch, also at 4,000 pounds, the dimensions of the first 30 x 30 x 15 inches, and of the other 30 x 20 x 12 inches. Space being at premium, and weight also a factor, would tanks or tubes be best?" A.—The dimensions given indicate that the "tanks" are to be rectangular. As it would be practically impossible to use such tanks for the purpose of high-pressure air storage, it would be useless to attempt any computation. Mannsemann tubes of steel seem to be the best known means of carrying compressed air. Tubes 8 inches diameter and 5-16 inch are very commonly used. The weight is about 100 pounds for each cubic foot of capacity. 2, If this air was reduced to the proper pressure and used to run a small compound engine (efficiency 100 per cent.), what would be the horse-power developed per hour? A.—We know nothing about efficiencies of 100 per cent., especially in this line, so that may as well be disregarded. If the tank full of air at 2,000 pounds pressure is at normal temperature, say 60 degrees, and if the air as it expands before use is also allowed to come to this normal temperature, then 1 cubic foot of air at 2,000 pounds will be about 17.5 cubic feet at 100 pounds, and if this is so used that it will expand adiabatically to atmospheric pressure before release, the mean effective working pressure will be 44 pounds. The terminal volume will be 70 cubic feet. If this air were used in a single long cylinder of 1 square foot (144 square inches) area, the work done would be $144 \times 44 \times 70 = 443{,}520$ foot pounds, and if the work were done in one minute it would represent $443{,}520 \div 33{,}000 = 13.42$ horse-power; if the work were done in an hour, then the horse-power would be $13.42 \div 60 = .223$. Heating the air before use, and at an intermediate stage if a compound engine were used, would increase this result at least 50 per cent. at slight fuel cost.

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One of the latest patents is for a time lock on a tobacco box. The user sets the mechanism when the pressure of good resolutions is strong, and when appetite is in the ascendant he has to borrow a "chew."

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We have received from the Massachusetts Institute of Technology, Boston, Mass., a schedule of their proposed summer courses in technical education. The subjects include Mechanical Drawing and Descriptive Geometry, Mathematics, Architecture, Chemistry, Biology, Physics, European History, Modern Languages, Mechanism and Shopwork. It gives us

pleasure to note that the great educational plants of this country are gradually being worked during a greater portion of the year than has heretofore been customary.

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It is announced that the engineering laboratory of Purdue University is to have a new locomotive. The old locomotive, which in six years in the laboratory has been run equivalent to 20,000 miles, and has served in an experimental study of important problems, will pass into active service at the head of trains, and "Schenectady No. 2" will take its place upon the testing plant. The new locomotive will possess a number of quite new features. It will carry pressures up to 250 pounds, and may be used either simple or compound. The cylinders and saddles will be independent castings, and the centers will be so chosen as to allow the use of cylinders up to 30 inches diameter. Several cylinders will be provided, and with a series of bushings a wide range of cylinder ratios in compound work will be possible.

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# Commercial Review.

NEW YORK, SATURDAY EVENING, MAY 15.

THE FOREIGN AND DOMESTIC MARKET FOR ENGINES AND BOILERS.

Engines and boilers differ radically from iron-working machinery in respect to the export demand for them that has recently been felt. They lack, in whole or in part, the stimulus that has come to machine tools from the great European reaching out for them which has been so obvious for a year past. Hence, the following letters from a few of the leading steam-power machinery companies, concerning foreign as well as home trade, are by no means a repetition of what we published in our last article, from the standpoint of the tool builders.

From the Edward P. Allis Company, Milwaukee, Wis.: "We are receiving about the customary number of orders and our works are fairly busy. The prices, however, are extremely low, which would indicate that there is not enough work in the market to go around."

From the Philadelphia Engineering Works, Philadelphia, Pa.: "Our export trade has fallen off very considerably since the first of January, 1897. This, we think, is due principally to the unsettled internal affairs of the foreign countries we have operated in, although reports from such countries now indicate a better feeling, and we may look for an increased demand during the fall. In reference to domestic business, we have not experienced any improvement over the same months in 1896, although we have had numerous inquiries, and we hope much of this business will be placed in hand during the fall months."

From the Westinghouse Machine Company, Pittsburg, Pa.: "Our product, namely, Westinghouse Compound, Standard and Junior engines, have always enjoyed a very large foreign market. During the last twelve months our foreign business has, however, shown a very marked increase, and has proved even better than usual, especially in the European markets. We have recently filled some very large orders for numbers of our larger compound engines sold in England, France, Belgium, Russia, Italy and Egypt. One of our later foreign sales was the first of a number of 1,200 horse-power Steeple compound engines required in a wire-drawing mill in France. The South American market has generally required only comparatively small engines, say from 25 to 150 horse-power, and while it does not show a falling off during the past year, it has not shown any material increase. The domestic market for all types of our engines has shown a very marked increase during the last nine months, and altogether we feel that business with us is in a very satisfactory conditon. Our large new shops have recently been completed and thoroughly equipped, and are at present as full of work as they can be comfortably, although there is, of course, always room for more. For some months back we have been obliged to work some of the

(Continued on page 35.)

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# Business Specials.

Gear wheels, gear cutting. Grant; see page 16.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Ct.

Engine Castings ⅛ to 2 H. P. Finished boilers and engines. Grant Sipp, Paterson, N. J.

Send $1 to the Tabor Mfg. Co., Elizabeth, N. J., for improved stop-motion revolution counter.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

Don't buy a Cab, Let, File! Write and we will tell you why. Peerless Novelty Works, Rochester, N. Y.

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# Wants.

**Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than Saturday Morning for the ensuing week's issue. Answers addressed to our care will be forwarded.**

## Situations Wanted.

Exp. mech. draught. seeks pos. Box 9, AM. MACH.

Mech. draftsman and designer, tech. grad., exper. machinist, wants pos. Box 4, AMER. MACHINIST.

Mech. draftsman, 24, tech. education, exp. in const. of gen. machines. Box 5, AMER. MACHINIST.

Foreman boiler maker wants pos.; up to-date hustler; reference. Box 7, AMERICAN MACHINIST.

Position as supt. or foreman by an up to-date hustler; engines or pumps. Box 8, AM. MACHINIST.

Position as foreman or supt. by exp. man in shop where drop forging is done. Box 11, AMER. MACH.

General machinist, tool maker, vise or machine hand, wants position. Box 215, AMER. MACHINIST.

Machine designer, tech. graduate, 6 years' exp., wants to change. Address Box 3, AM. MACHINIST.

Mech. eng. wants pos. June 1; exp. in electricity, also in design of automatic and general machinery. Box 217, AMERICAN MACHINIST.

Situation wanted by a mechanical, technical educated draughtsman, 4 years in shop and drawing office. Box 10, AMERICAN MACHINIST.

Foreman patternmaker, wants posi.; good and fast work guaranteed on large or small patterns; references. Address Box 210, AMER. MACHINIST.

Wanted—Position as supt. or foreman; well up in modern boiler construction, tools, estimating and handling of men. Address Box 16 AM. MACHINIST.

Exp. machinist and draftsman, who has served as general foreman in different shops throughout the country, desires position as foreman or supt. Best of references. Box 216, AMERICAN MACHINIST

Mech. eng., 31, wide experience and education, mem. A.S.M.E., owns valuable pats. on gas engs. for direct cpld. elec. serv., desires con. with subtl. concern needing eng. or supt. Box 198, AM. MACH.

A party with a number of years' exp. in mfg. companies desires a situation as assistant to some mfg. co. Details and management of help pref. Ref. furn. Ad. M. W. C., P. O. Box 1829, Boston, Mass.

Young man, technically educated 6 years' shop, draughting and road exp., designing and erecting engines, pumping machinery, etc., desires a position at draughting or as assistant superintendent or foreman. Address "Newton," care AM. MACH.

## Help Wanted.

Reliable mechanics to sell my calipers, etc.; good pay. Address E. G. Smith, Columbia, Pa.

Draftsman on sugar machinery, also assistant to make tracings. Location, Brooklyn. State experience and salary. Address P. O. Box 1815, N. Y.

Wanted—A first class die-sinker; one who is capable of laying out work and taking charge of die sinking in a drop-forge shop. Address P. O. Box 266, Worcester, Mass.

Wanted—An experienced foreman to take charge of machine department of elevator works. State wages wanted and send references. Address Box 15, AMERICAN MACHINIST.

Wanted—An exp. mech. draftsman, who can give good ref. as to character and ability. Position permanent to one who can fill the position satisfactorily Address Box 211, AMERICAN MACHINIST.

Wanted—An experienced salesman, who has a wide acquaintance with the hardware trade, to represent a manufacturing company and sell on commission. Address Box 13, AMER. MACHINIST.

Wanted—Machine tool contractor; thoroughly practical and capable of handling 50 men, to manufacture engine lathes, and with enough money to buy a one half interest; business well established. Address Box 204, AMERICAN MACHINIST.

Wanted—Foreman for small mach. shop emp. about 30 men. Only those well up on high sp'd eng. work & familiar with mod. meth. of get'g out work at lowest cost need apply. State exp. in detail and wages exp. "Western New York," care AM. MACH.

Wanted—A fine mechanic who understands the manfg. of scientific instru., clock movements, etc. Must be capable of accurate and cheap work and up to date in the manfg. Address, giving wages expected and experience, etc., Box 14, AM. MACH.

Wanted—For a large pump company an active practical, up-to date man as supt. Prefer one who can invest in a portion of the company's stock. Full investigation given and required; state qualifications and references. Address Box 6, AMERICAN MACHINIST.

Wanted—At once a temperate man to run auto screw machines. Must be willing to work nights part of the time Must be able to run the machinet on very close work. Good position for the righ, man. Address Wm. L. Gilbert Clock Company, Geo. B. Woodruff, Assistant Supt., Winsted, Conn.

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# Miscellaneous Wants.

**Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.**

Cheap 2d h'd lathes & planers. S.M.York, Clev'd, O.

Calipers & Gauges. F.A.Welles, Milwaukee, Wis.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Best and cheapest Bolt Header, made by Baush & Harris Machine Tool Co., Springfield, Mass.

Models, experimental and small special machy. built. Write to Crocker & Lawson, Binghamton, N.Y.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

For Sale—Second-hand drill presses, engine lathes & planers. Dietz, Schumacher & Boye, Cincinnati, O.

For Sale—12 inch silver on glass speculum with flat; finest definition guaranteed. O. L. Petitdidier, Mount Carmel, Ill.

We make a specialty of Shartle's patent safety set collars. Prices low and samples free. Middletown Machine Co., Middletown, Ohio.

Wanted—Every reader of this paper to send 35 cents for The Tool Catalogue. See Montgomery's advertisement on page 15 of this edition.

(Continued on page 35.)

(Continued from page 34.)

departments on heavier work, on night turn."

From McIntosh, Seymour & Co., Auburn, N. Y.: "The trade in this country, so far as we come in contact with it, seems to be pretty good. We have all we can handle and are running night and day, and are enlarging our works."

From W. D. Forbes & Co., Hoboken, N. J.: "We beg to say that we are hardly in a position to give you information of value, but we feel confident that we will do considerable export trade in our light high-speed electric lighting and yacht engines during the next twelve months. We are very much satisfied with the home market on these engines, and we are now running a larger force than we had any hope of doing, six months ago."

From the American Engine Co., Bound Brook, N. J.: "We have never given much attention to the export trade, and are therefore not in a position to note any changes in the situation. In regard to the domestic trade, our business has been steadily improving, and we are now very full of work and running our establishment night and day. Our observation is that there is a general improvement all around."

From an engine and boiler manufacturing concern in the Central West: "We hardly feel that we are competent to judge in regard to the character of the foreign market for machinery this year, as we are not largely enough interested in it or engaged in it to be thoroughly posted. We are taking means to reach out after some of this foreign trade, and we hope another year to be in position to do something in this line. For this reason, we would not care to have you use our name in connection with the matter. In regard to the domestic market, we would say that it is not satisfactory and is very uncertain, and we see nothing in the future indicating any material change for the better, and find this to be the condition existing almost universally with those with whom we are brought in contact."

One of the best-known engine-building companies in this country, who prefer to remain anonymous, write that they are at present doing very little in the way of export trade, but that they have no doubt that the visit here in June next of the delegation of Spanish-American merchants will be productive of great good. They say that there is very little doing in the domestic trade and that they are unable at this time to forecast prospects for the remainder of the year.

A leading boiler company, who are not usually unwilling, upon a proper occasion, to state their views, write that at the present time they would prefer to make no expression touching the boiler business, from either a domestic or foreign standpoint; which we take to imply that

(Continued on page 36.)


## MISCELLANEOUS WANTS.

(Continued from page 34.)

Wanted—Inventors before applying for a patent get "How to Apply for a Patent," $1. Sample pages free. Henry F. Noyes, 56 Liberty Street, N. Y.

Wanted—The address of every young man who wishes to study mechpnical engineering at a low cost. Mech. Dept., Agricultural College, P.O., Mich.

Wanted—Drawings for const. a double cyl. reversible engine, to be oper. by compound air; cyl. about 2½ inches dia. Address Box 2, AMER. MACHINIST.

A well equipped machine shop in N. Y. City, established 20 years, now doing a paying business, will bear investigation, will be sold reasonable. Address Box 12, AMERICAN MACHINIST.

Wanted—An Idea. Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write John Wedderburn & Co., Patent Attorneys, Washington, D. C., for their $1,800 prize offered to inventors.

A machine shop, with modern equipment, heavy and light machinery, cranes of 20 tons capacity and 10,000 square feet of unoccupied floor space, would contract to manufacture any kind of machinery. Parties already having machinery built under contract might do well to write us for estimates. Box 62, AMERICAN MACHINIST.

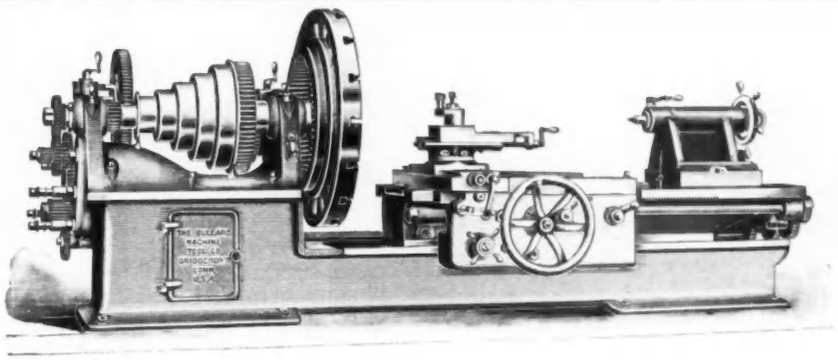
**HENRY CAREY BAIRD & CO.,**
**Industrial Publishers, Booksellers and Importers**
**• 810 Walnut Street, PHILADELPHIA.**

☞Our New and Revised Catalogue of Practical and Scientific Books, 88 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

**Columbia University**
**in the City of New York.**

SCHOOL OF MINES,
SCHOOL OF CHEMISTRY,
SCHOOL OF ENGINEERING,
SCHOOL OF ARCHITECTURE,
SCHOOL OF PURE SCIENCE.

Four years' undergraduate courses and special facilities for graduate work in all departments. Circulars forwarded on application to the Secretary of the University.



# Perhaps——

This Extension Lathe, which is 32-inch swing ordinarily, and 54 when the gap is opened, would do all the large work you need to handle and cost you less, be more useful and earn more money than two Lathes—a 32 and a 54. It's keeping machines busy that saves money, and, in a job shop, it's hard to keep a big Lathe busy. The Extension is better than a gap. Let us explain its merits to you.

⚜

# The Bullard Machine Tool Co.

## Bridgeport, Conn.

⚜

European Agents:

CHAS. CHURCHILL & CO., London.

SCHUCHARDT, SCHUTTE & CO., Berlin, Vienna and Brussels.

(Continued from page 35.)

they do not think favorably of the situation.

STRUCTURAL MATERIAL.

The Berlin Iron Bridge Company, of East Berlin, Cann., report that they are working full time, and that spring business is opening up in quite a brisk manner. They have a large number of contracts on hand, including a water-tower at North Berwick, Me.; large school building in East Albany, N. Y.; steel framework for the Providence Institution for Savings, at Providence, R. I.; steel framework for the new Waterbury Savings Bank, at Waterbury, Conn.; large addition to the Waterbury-Farrel Foundry & Machine Co., at Waterbury, Conn., and a long list of others.

## Quotations.

NEW YORK, Monday, May 17.

Iron—American pig, tidewater delivery:

| | |
|---|---|
| No. 1 foundry, Northern | $12 00 @ $12 50 |
| No. 2 foundry, Northern | 11 00 @ 11 25 |
| No. 2 plain, Northern | 10 50 @ 11 00 |
| Gray forge, Northern | 9 75 @ 10 25 |
| No. 1 foundry, Southern | 10 25 @ 10 75 |
| No. 2 foundry, Southern | 9 75 @ 10 00 |
| No. 3 foundry, Southern | 9 50 @ 10 00 |
| No. 1 soft, Southern | 10 25 @ 10 50 |
| No. 2 soft, Southern | 9 75 @ 10 00 |
| Foundry forge, or No. 4, Southern | 9 25 @ 9 50 |

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.00 @ 1.05c.; refined, 1.10 @ 1.25c. Store prices: Common, 1.25 @ 1.35c.; refined, 1.35 @ 1.45c.

Tool Steel—Ordinary sizes, standard quality, 6 @ 7c., with some brands perhaps a little less; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.50c.

Cold Rolled Steel Shafting—Base size, 2.50c., in small lots, from store.

Copper—Carload lots, Lake Superior ingot, 11 @ 11¼c.; electrolytic, 10⅝ @ 10¾c.; casting copper, 10⅜ @ 10⅝c.

Pig Lead—In carload lots, 3.25 @ 3.30c., f. o. b., New York.

Pig Tin—For 5 and 10-ton lots, 13½c., f. o. b.

Spelter—In carload lots, New York delivery, 4.15 @ 4.25., f. o. b.

Antimony—Cookson's, 7¼ @ 7½c.; Hallett's, 7 @ 7¼c.

Lard Oil—Prime city, present make, commercial quality, in wholesale lots, 37 @ 39c.

▲ ▲ ▲

## New Catalogs.

**There are three sizes of Standard Catalogs, first authorized by the Master Car Builders' Association, 9" x 12", 6" x 9" and 3½" x 6". We recommend the 6" x 9" size for machinery catalogs. When they must be larger or smaller, one of the other standard sizes should be adopted if possible.**

We have received from the Babcock Printing Press Manufacturing Company, New London, Conn., an illustrated catalog, descriptive of the "New Columbia Optimus" printing press. A number of testimonial letters are given in the catalog, which is 6¾ x 10¼ inches.

We have received from Jos. Wilckes, 106-108 Fulton street, a circular, descriptive of the "Econometer," an instrument for indicating, continuously and automatically, the percentage of carbonic acid in the gases, and which shows at all times the more or less favorable conditions of combustion. The circular contains very full details of the instrument and will be mailed to anyone interested, upon application.

▲ ▲ ▲

## Manufactures.

A new power-house is being erected at Torrington, Conn.

The boot and shoe factory of Poore & Dole at Seabrook, N. H.

(Continued on page 37.)

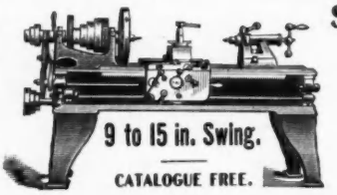

The Pratt & Whitney Co. HARTFORD, CONN., U.S.A.

...MAKERS OF...

Fine Machine Tools.

Complete Plants furnished for Bicycle, Typewriter, Gun and Sewing Machine Makers. Gauges and Small Tools for all Machine Work. Drop Hammers and Trimming Presses. Forging and Trimming Dies for all classes of work.

*England*—Buck & Hickman, 280 Whitechapel Road, London, E. *France*—Fenwick Freres & Co., 21 Rue Martel, Paris. *Chicago*—42 and 44 South Clinton Street. *Boston*—281 Franklin Street. *New York*—123 Liberty Street.




CATALOGUE FREE.

SPEAKING OF LATHES! We are building them in various sizes from 9-in. to 15-in. swing, in various lengths, both engine and speed lathes. Our designs are the latest and most approved, while the workmanship, material and finish are of the highest order. Our catalogue will tell you all about them, as well as of our planers, shapers, drills and other tools and supplies.

SEBASTIAN LATHE COMPANY,

117 and 119 CULVERT STREET, CINCINNATI, OHIO.

FOR FOUNDRYMEN

EACH, 12mo, cloth, $2.50.

WEST. "American Foundry Practice."
WEST. "Moulders' Text Book."
BOLLAND. "Iron Founder."
BOLLAND. "Iron Founder, Supplement."

JOHN WILEY & SONS, 53 EAST TENTH STREET, NEW YORK.

"LIGHTNING" SCREW PLATES,

For Machinists, Electricians, Bicycle Repairers, &c., Adjustable Dies with Guides.

SEND FOR CATALOGUE.

WILEY & RUSSELL MFG. CO.,

Greenfield, Mass., U. S. A.

Agents in London, SELIG, SONENTHAL & CO., 85 Queen Victoria Street.

DYER & DRISCOLL,

PATENT SOLICITORS, 36 WALL ST., N.Y.

Have done all my patent soliciting work, both for this and foreign countries, continuously for the past fourteen years.

Thomas A. Edison

STAR LATHES

★ ★ ★

Foot Power Screw Cutting, Automatic Cross Feed, 9 and 12" Swing.

Send for Catalog B.

Seneca Falls Mfg. Co.

687 Water St., Seneca Falls, N.Y.

WHEN YOU ARE OFFERED JENKINS' or JENKINS BROS.' DISCS that have Trade Mark same as cut, they are all right for high pressure steam. All others are imitations and you cannot hold us responsible. If you cannot get our discs from your dealer, send to us for them.

JENKINS BROS., 71 John Street, New York.

31 N. Canal St., Chicago. 117 N. 4th St., Philadelphia. 17 Pearl St., Boston.

Walker Universal Tool and Cutter Grinder.

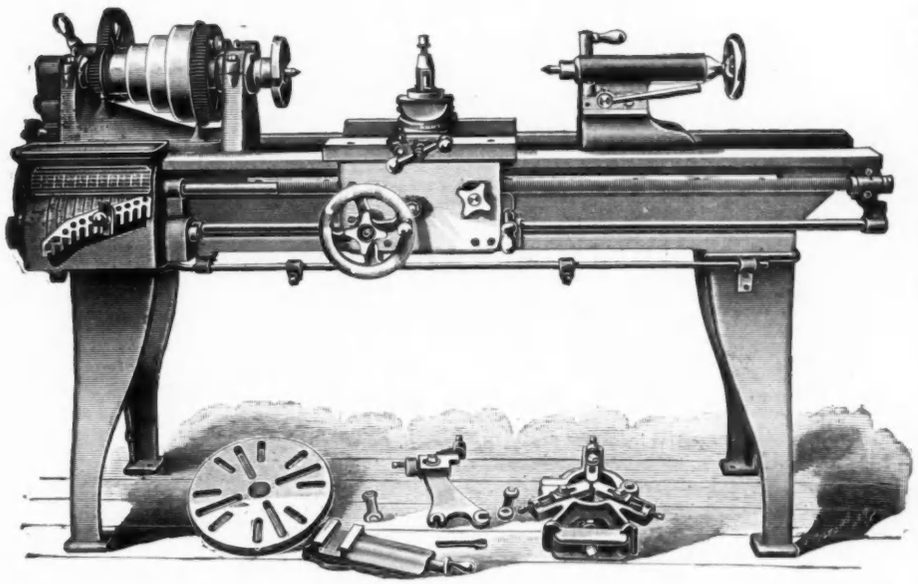
SEND FOR COMPLETE CATALOGUE.

NORTON EMERY WHEEL CO.
WORCESTER, MASS.

You will always get better results by specifying the purpose for which steel ordered is to be used. HAVE YOUR STEEL FITTED TO YOUR WORK. This is our specialty.

CRESCENT STEEL COMPANY, PITTSBURGH, PA. CHICAGO, ILL. NEW YORK, N. Y. DENVER, COL.

# THIS LATHE COMBINES THE LATEST AND BEST IMPROVEMENTS.



## 14 in. x 6 ft. Hendey-Norton Lathe

**With Improved Automatic Stop.**

• • •

### AUTOMATIC STOP

**It is durable, simple, indispensable. It will automatically stop the carriage in either direction. It is equally efficient whether feeding or thread-cutting, running up to a shoulder, boring to bottom of holes, or internal thread-cutting. No danger of spoiling either tool or work. It is a safeguard against accidents in either direction.**

### CARRIAGE

**The carriage reverses in apron; no slamming of countershaft. There is no comparison between this lathe and the old style or common lathe.**

### THREADS

**It has all threads in daily use with simple movement of lever.**

### FEEDS

**Has all feeds in daily use with simple movement of lever. Send for Circular.**

• • •

## THE HENDEY MACHINE COMPANY,

**Torrington, Conn.**

**Agents for the Pacific Coast, PACIFIC TOOL AND SUPPLY CO., San Francisco, Cal.**

**European Agents,** { CHAS. CHURCHILL & CO., Ltd., London and Birmingham. SCHUCHARDT & SCHÜTTE, Berlin and Vienna. EUGENE SOLLER, Basel, Switzerland.


*(Continued from page 36.)*

The Illinois Glass Factory is building a new glass factory at Alton, Ill.

Harriman Bros., Maynard, Mass., will make some improvement in their plant.

At Coxsackie, N. Y., Charles & Joseph Walthers are erecting a new foundry.

At Mauch Chunk, Pa., Bear & Co., of Paterson, N. J., will erect a plant.

It is probable that J. J. Fretwell, of Anderson, S. C., will erect a cotton mill.

At Wilkesbarre, Pa., the Golden Silk Company contemplate erecting a silk mill.

The Columbia Worsted Company, of Wallingford, Pa., is adding new machinery.

The planing mill of Harris & Dutra at Providence, R. I., has been destroyed by fire.

The Indian Head Cotton Mills at Cordova, Ala., will install new and improved machinery.

At New Kensington, Pa., the Pittsburg Tin Plate Works are to make an addition to their plant.

Torrey Bros., Bath, Me., contemplate the erection of an addition to their plant at an early date.

The Dewees Wood Company, of McKeesport, Pa., contemplates the addition of new machinery.

At Nashua, N. H., the Estabrook & Anderson Company are having an addition erected to their plant.

It is expected that the Glens Falls Paper Mill Company will erect a new factory at Cadyville, N. Y.

At Carlisle, Pa., the Penna. Silk Company is about to erect a silk mill. New machinery will be purchased.

The Washington Steel & Tin Plate Company, of Pittsburg, Pa., will shortly erect several new buildings.

The Rippell Manufacturing Company, formerly of Mount Gilead, will open an iron foundry at Columbus, O.

The foundry and machine shops of McElwane-Richards., at Noblesville, Ind., were recently destroyed by fire.

A. Weiskittel & Sons, Baltimore, Md., have purchased additional land, and will extend their iron foundry business.

The Woonsocket (R. I.) Napping Machinery Company propose the erection of a 40 x 100 foot addition to their factory.

The Standard Mill, at Cohoes, N. Y., recently purchased by the Parsons Manufacturing Company, will enlarge the plant.

At Negaunee, Mich., an engine house and machinery, belonging to Samuel Mitchell, of Detroit, were destroyed by fire.

The Street Sweeping & Loading Machine Company, of St. Louis, Mo., has increased its capital stock from $10,000 to $20,000.

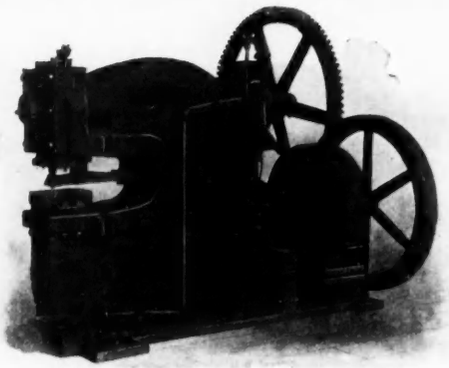
Mr. Ira Myers, president of the Diamond River Mining Company, reports that the company will erect a concentrator at Nethart, Mont.

Col. John R. King, President of the Livingston Water Company, will commence the erection of a flouring mill at Gateway City, Mont.

The Colorado-Philadelphia Reduction Company, at Colorado City, will make improvements to their plant and install new machinery.

Mr. Thomas Towne, Eastern sales agent of the Union Drawn Steel Company, has removed from 136 Liberty street to Bowling Green Building, 5-11 Broadway, N. Y.

At Shippensburg, Pa., Messrs. C. A. Goodhart, of Shippensburg; E. E. Long, of Shenandoah, Va., and George Forry, of Carlisle, Pa., are interested in the erection of a machine shop.



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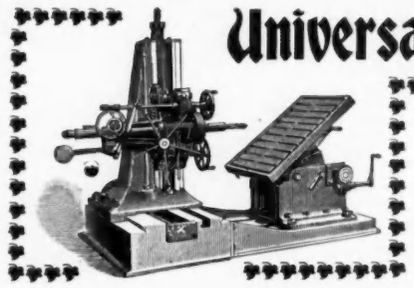

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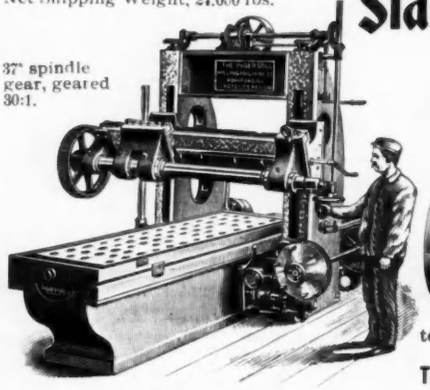

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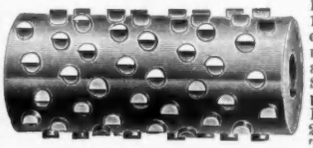

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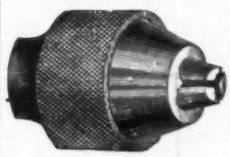

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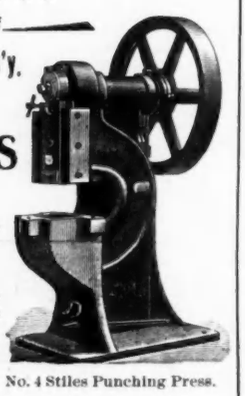

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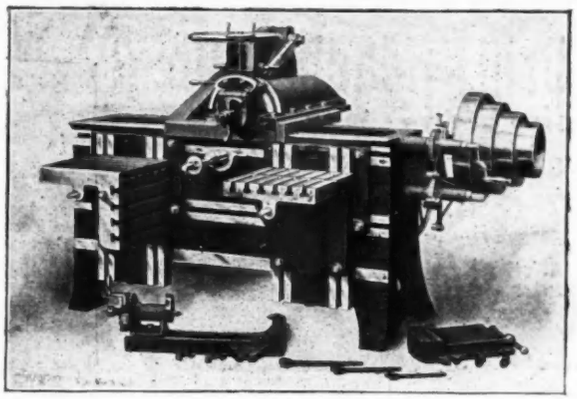

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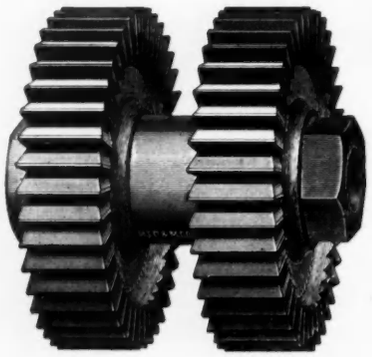
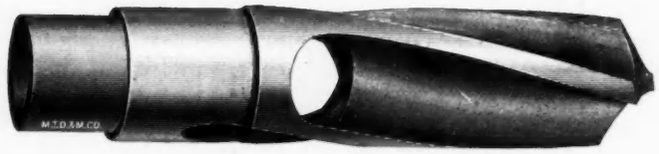
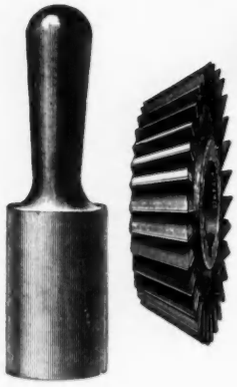
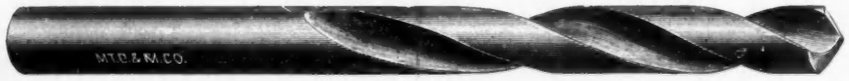
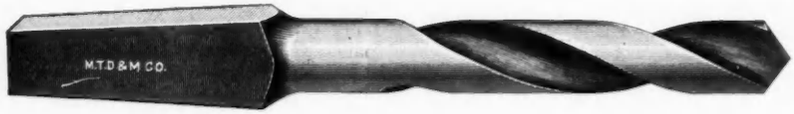
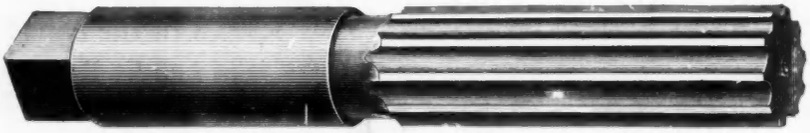
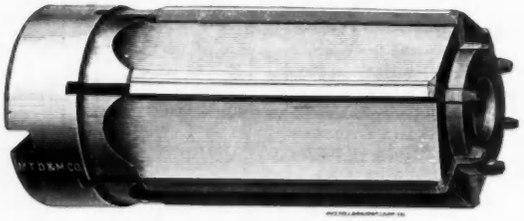
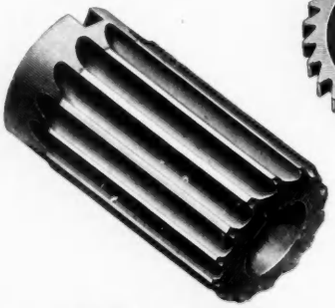
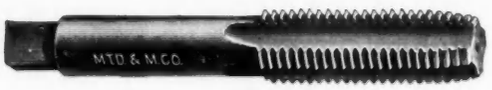
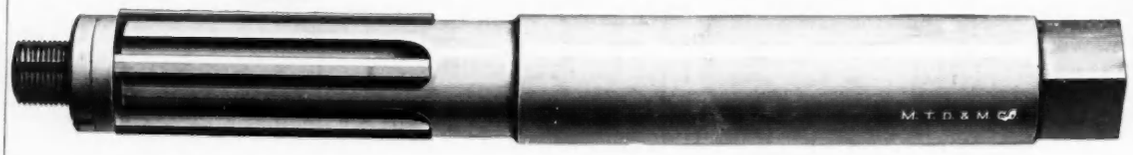
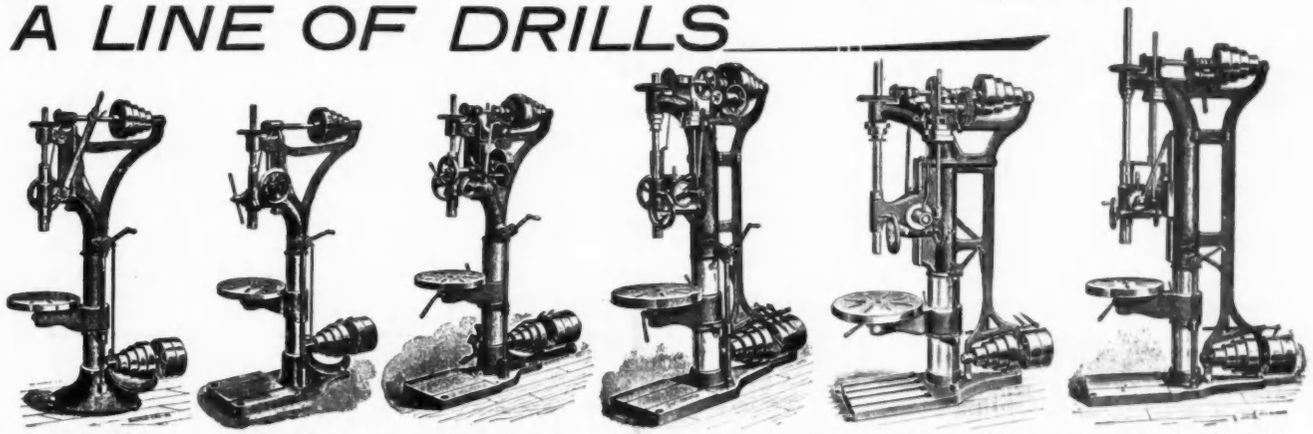



# A LINE OF DRILLS



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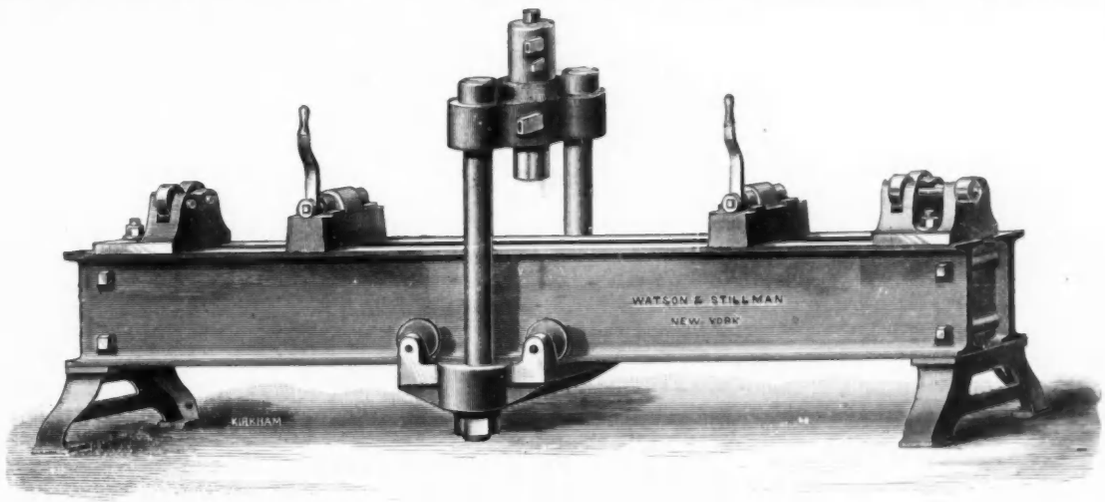


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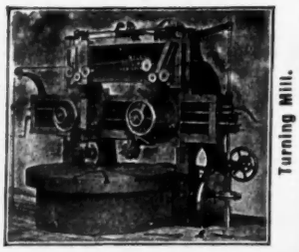
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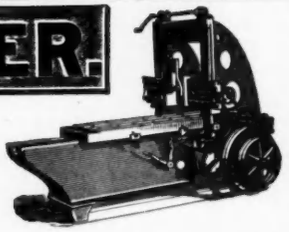

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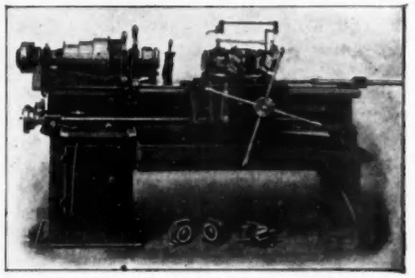

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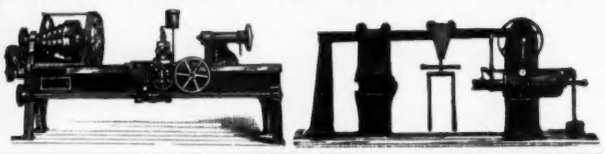

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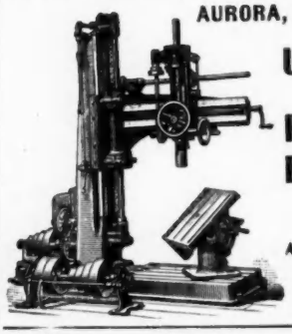

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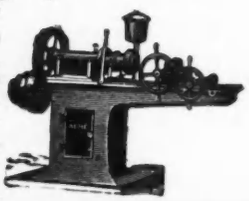

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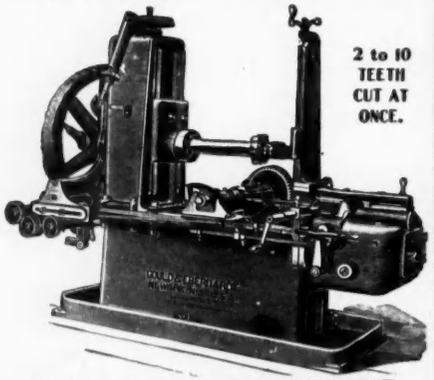

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